

FINAL REPORT

Dingell-Johnson Project F-1-R-39

Study S-37

RECREATIONAL USE SURVEY OF THE LOWER OSAGE RIVER

Missouri Department of Conservation

Jerry J. Presley, Director

Kenneth M. Babcock, Assistant Director

Dan Dickneite, D-J Coordinator

James P. Fry, Chief, Division of Fisheries

Date prepared:
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Prepared by:


Fisheries Biometrics Supervisor

Approved by:


Assistant Fisheries Division Chief-Research

TABLE OF CONTENTS

ABSTRACT	i
INTRODUCTION	1
DESCRIPTION OF STUDY AREA	1
THE OSAGE RIVER BASIN	1
THE LOWER OSAGE RIVER	2
THE STUDY SEGMENTS	2
Upper Segment	3
Middle Segment	5
Lower Segment	6
METHODS	6
RESULTS	9
UPPER SEGMENT	11
Recreational Use	11
Harvest Summary	11
User Characteristics	12
MIDDLE SEGMENT	20
Recreational Use	20
Harvest Summary	20
User Characteristics	21
LOWER SEGMENT	29
Recreational Use	29
Harvest Summary	29
User Characteristics	30
ALL SEGMENTS	42
Recreational Use	42
Harvest Summary	42
User Characteristics	42
Weather Conditions	42
COMPARISON WITH OTHER RIVER RECREATIONAL USE SURVEYS	49
CONCLUSIONS	49
ACKNOWLEDGEMENTS	52
REFERENCES	53
Appendix A. Beginning and ending dates for each season.	A-1
Appendix B. Day of the week and time of day probabilities for the lower Osage River ..	A-1

Appendix C. Site probabilities for the stations sampled on the lower Osage River	A-2
Appendix D. Recreational use survey form	A-3
Appendix E. Fish length form	A-4
Appendix F. Estimated annual recreational visits and hours for the upper segment during fall	A-5
Appendix G. Estimated annual recreational visits and hours for the upper segment during winter	A-6
Appendix H. Estimated annual recreational visits and hours for the upper segment during summer	A-7
Appendix I. Estimated annual recreational visits and hours for the middle segment during fall	A-8
Appendix J. Estimated annual recreational visits and hours for the middle segment during winter	A-9
Appendix K. Estimated annual recreational visits and hours for the middle segment during summer	A-10
Appendix L. Estimated annual recreational visits and hours for the lower segment during fall	A-11
Appendix M. Estimated annual recreational visits and hours for the lower segment during winter	A-12
Appendix N. Estimated annual recreational visits and hours for the lower segment during summer	A-13
Appendix O. Estimated annual recreational visits and hours for all segments combined during fall	A-14
Appendix P. Estimated annual recreational visits and hours for all segments during winter	A-15
Appendix Q. Estimated annual recreational visits and hours for all segments during summer	A-16

ABSTRACT

Recreational use was measured for one year on the 81.7 miles of the lower Osage River from Bagnell Dam to the Osage River's confluence with the Missouri River. The river was divided into three segments: a 65-mile lower segment, from the mouth upstream to the town of Tuscumbia; a 15.4 middle segment, from Tuscumbia to the Federal Highway 54 bridge; and a 1.2 mile upper segment, from the bridge to Bagnell Dam. Eighteen accesses were used to survey individuals; six were Department of Conservation accesses. The year was divided into three periods: fall, from late August to mid-December; winter, from mid-December to early March; and spring-summer, from early March to late August.

Thirty-six activities were recorded, including six types of fishing, nine types of hunting, trapping, and twenty types of non-consumptive use. Over 17,400 individuals were contacted, producing estimated visits of over 163,000, and 960,000 estimated hours of use. The lower and upper segments had about equal numbers of estimated visits--67,000 and 63,000 respectively--and the middle segment had 33,000 estimated visits. As expected, fishing accounted for most of the visits. Camping, followed by fishing, accounted for the most hours. Because the access areas were small, hunting visits were few. A variety of non-consumptive activities were measured, ranging from typical river uses like boating and water skiing to picnicking, hiking, and eagle watching.

Fishing activities included four common fishing methods: angling, trotlining, glogging, and snagging. An estimated 125,000 fish were harvested. Channel catfish were the most-harvested species (51,000 estimated harvest), and walleye and sturgeon were reported although grouped in the "other" fish category.

Power generation at Bagnell Dam can produce wide fluctuations in the water level of the Osage River below Bagnell Dam. This apparently does not affect recreational use.

INTRODUCTION

Estimates of outdoor recreational use of 81.7 miles of the lower Osage River in central Missouri were determined to provide public use data for state, federal, and other private and public agencies. This stretch of river is affected by substantial changes in water level and volume of flow due to wide variations in power production at Bagnell Dam, which is operated by the Union Electric Company.

The area surrounding the lower Osage River has experienced considerable population growth. This makes recreational use estimates valuable information, particularly as a benchmarks from which to measure future trends. Recreational use on this portion of the river has received little study, except for an evaluation of fishing success in the tailwater immediately below Bagnell Dam (Hanson, 1977). Angling success for this section of river was determined in a statewide mail survey (Hanson, 1980). However, these studies did not include the wide variety of other activities that regularly occur on this stretch of water. A study by Fleener (1971a) revealed that rivers are used for many types of recreation in addition to angling, and the lower Osage River is no exception. The present study measures the activities which occurred on the lower Osage River throughout an entire year.

DESCRIPTION OF STUDY AREA

THE OSAGE RIVER BASIN

The Osage River basin encompasses about 15,300 square miles, of which about 11,000 square miles are in Missouri. The Osage River is the third largest river in the state. One hundred species of fish have been identified in this river basin (Pflieger, 1971).

The most prominent feature of the Osage River Basin is Lake of the Ozarks, a private power supply reservoir built on the Osage River by Union Electric Company in 1931. Its generating facility at Bagnell Dam can produce 172,000 kilowatt hours of electricity. At the

upper end of Lake of the Ozarks is Harry S. Truman Reservoir (impounded in 1979), a Corps of Engineers power supply facility capable of producing 160,000 kilowatt hours of power.

Upstream from Truman Dam, on tributary streams, are Pomme de Terre Reservoir (1961), a flood storage facility, and Stockton Reservoir (1969), a storage and power generating facility that can produce a total of 45,200 kilowatt hours.

THE LOWER OSAGE RIVER

About 1,300 square miles of the Osage River basin, and 81.7 miles of the river itself, are located below Bagnell Dam (Funk, 1968). The flow of this portion of the Osage River is not substantially augmented by springs. The minimum recorded river flow before construction of Bagnell Dam was 322 c.f.s. (in December, 1917). Many of the 100 fish species in the Osage River Basin are found in this stretch of the river.

All of the reservoirs in the Osage River basin influence to some extent the water flow of the Osage River below Bagnell Dam. The water level and volume of flow of these reservoirs are quite dynamic and strongly influence the character of this portion of the river.

The lower Osage River's flow is dominated by hydroelectric generation discharges from Bagnell Dam that range from 0 to 33,680 c.f.s. Tailwater levels immediately below Bagnell Dam can rise as much as 16 feet under full generation. The maximum spillway flow with Lake of the Ozarks at 660 feet above sea level is 148,800 c.f.s. Minimum permissible flow is 450 c.f.s.

THE STUDY SEGMENTS

The study area consisted of the full 81.7 miles of the lower Osage River (from Bagnell Dam to its confluence with the Missouri River, 14 miles east of the Federal Highway 54 bridge at Jefferson City, Missouri), along with an approximate 100-foot band of land on each side of the stream (Figure 1). The total area surveyed was 8,319 acres (6,338 water and 1,981 land),

or about 13 square miles of recreation area, with an average of 102 acres per river mile.

This area was divided into three major segments (upper, middle, and lower) with recreational use measured at access sites on each segment.

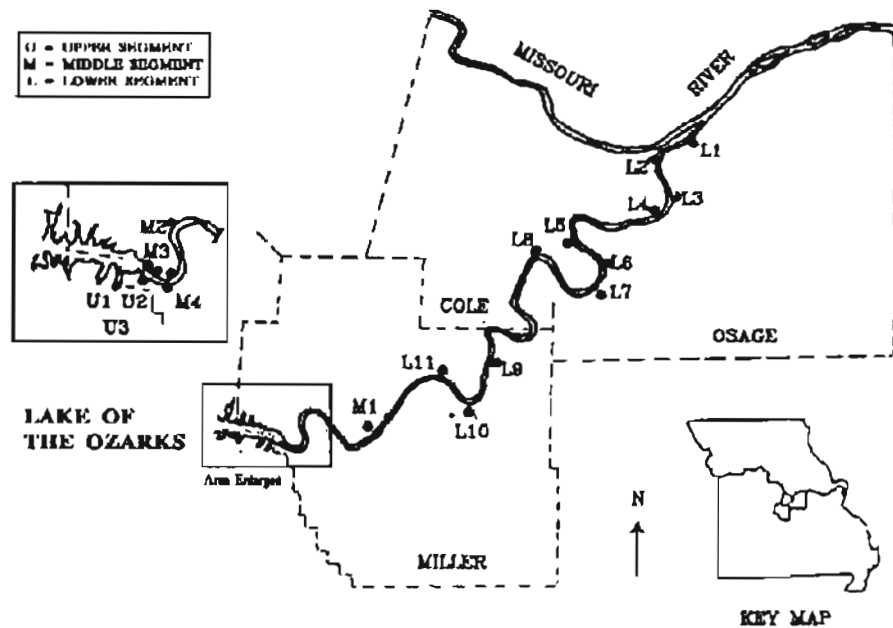


Figure 1. The lower Osage River study area.

Upper Segment

The upper segment is only 1.2 miles long, from the face of Bagnell Dam to the U.S. Highway 54 bridge (Figure 2). However, this short segment contained three heavily used accesses. One site, built by the Department of Conservation, has two concrete boat launching ramps and a large parking area. Another, owned by Union Electric Company, is at the face of the powerhouse and provides bank fishing, a small commercial business, and parking for tourists and Bagnell Dam visitors. The third access is owned by the American Legion and is across the river from the other two access sites. This site provides bank

fishing, limited boat launching, extensive family campgrounds, a bar and restaurant, and meeting facilities for the local chapter of the Legion.

An estimated 79 acres of water and 32 acres of land were surveyed on the upper segment of the lower Osage River, about 85 acres per mile. All three sites were surveyed.

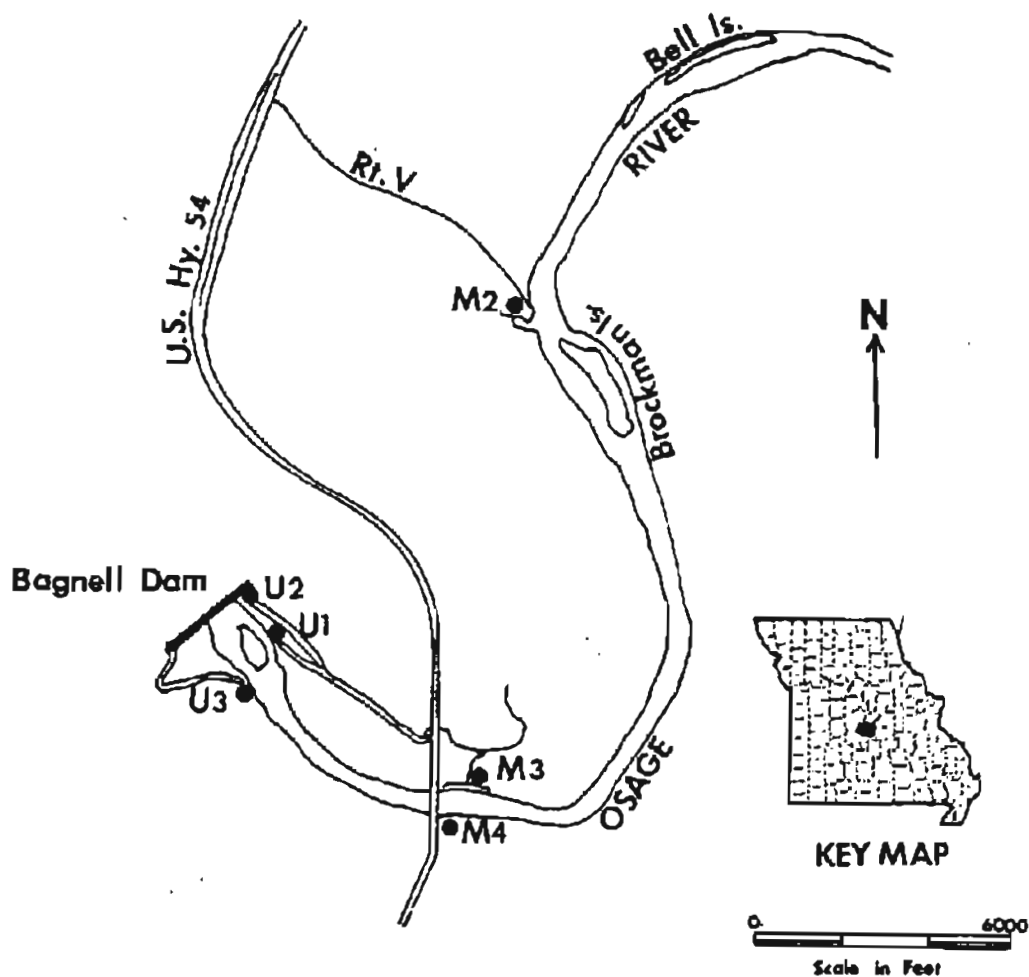


Figure 2. The upper segment of the lower Osage River.

Middle Segment

The middle segment of the lower Osage River is 15.4 miles long, from the U.S. Highway 54 bridge to the northern part of Tuscumbia (Figure 3). Just below the 54 bridge is a campground area on one side of the river and a trailer camp with a boat dock and concrete ramp on the other side. Farther downstream, two campground and cabin rental resorts at the site of Old Bagnell and a Department of Conservation access with a concrete ramp at Tuscumbia were surveyed. There are three other private accesses on this segment that were not sampled because of little use and difficult access. A large rock quarry and gravel dredging business is located near the upper end of this segment. An estimated 1,027 acres of water and 373 acres of land were surveyed on the middle segment, about 91 acres per mile. Four sites were surveyed.

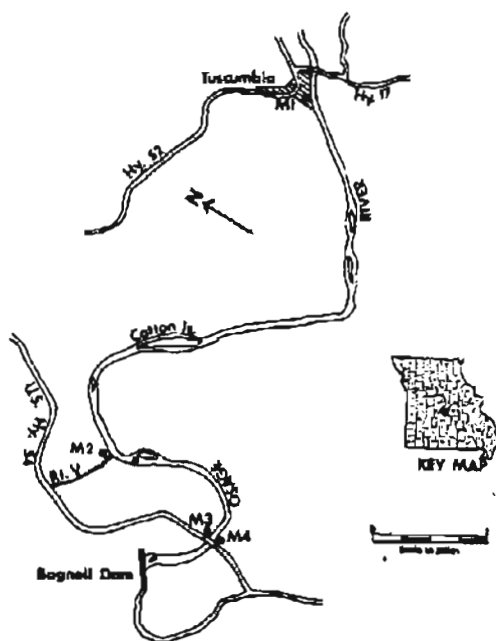


Figure 3. The middle segment of the lower Osage River.

Lower Segment

The lower segment is 65 miles long from Tuscumbia to the confluence of the Osage River with the Missouri River (Figure 4). This segment had five Department of Conservation access sites with concrete ramps and parking lots, which were heavily used. Two other Department of Conservation sites, one with a concrete ramp, received only seasonal use and were classified with the "other" sites (see Methods section).

This lower segment has a large number of private docks, boat ramps, and stairways which provide water access on high stream banks. Accompanying these scattered private accesses were cottages, cabins, and permanently mounted house trailers. One hundred eighteen boat docks (one and two boat size), 50 concrete or gravel boat launching ramps, and 45 stairways were counted while floating all but 9 miles of this segment of the river. The number of cottages, cabins, and house trailers were not counted.

An estimated 5,232 acres of water and 1,576 acres of land were surveyed on the lower segment, about 105 acres per mile. A total of eleven public and private access sites were surveyed on the lower segment.

METHODS

Recreational use on the 81.7 miles of the lower Osage River, including the border strip of riparian land, was estimated from information obtained in interviews with departing individuals at randomly selected access sites from August 23, 1987 to December 17, 1988. The sampling and estimation methods are outlined by Fleener (1982). The entire 81.7 miles of river was surveyed by six clerks. The first fall period ran from August 23, 1987 to December 19, 1987; the winter period from December 20, 1987 to March 5, 1988; the summer period from March 6, 1988 to August 29, 1988; and the second fall period from August 30,

1988 to December 17, 1988 (Appendix A). Sampling problems during the first fall period at some sites forced an extension of the sampling for those sites during the second fall period.

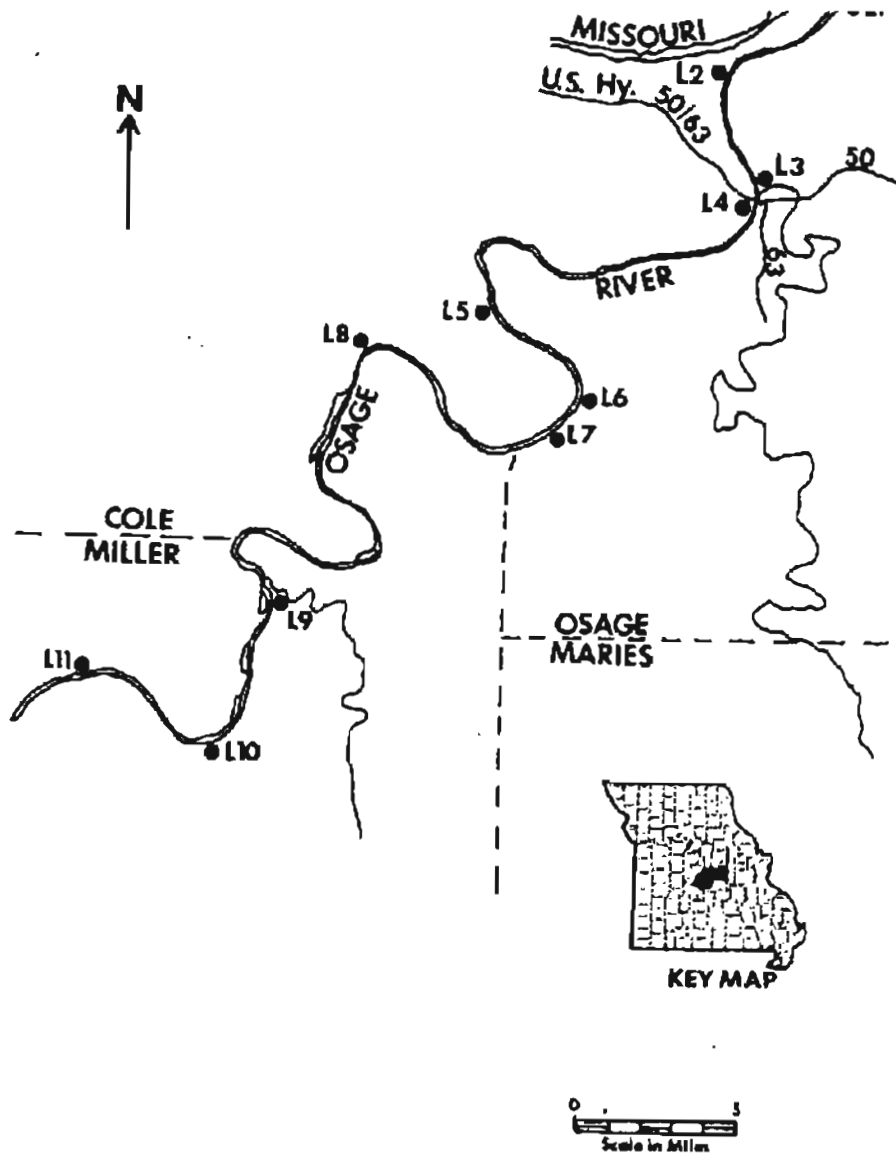


Figure 4. The lower segment of the lower Osage River.

Sampling sites were selected on the basis of known recreational use and were mainly at bridge crossings, resort areas, private accesses, and Department of Conservation accesses. A Department access that was easy to get to and had a concrete boat ramp was considered a "major" site; all other accesses, including other Department accesses, were designated as "other" sites.

Trained census clerks interviewed departing individuals during a randomly selected 8-hour period on randomly selected days. The daily time periods (0000-0800, 0800-1600, and 1600-0000) were labeled A, B, and C, respectively, and were selected on the basis of probable use (Appendix B). Schedules were made on a weekly basis for the fall and summer periods. Each major site was sampled three times per week. The sites designated as "other" on each segment were sampled together; that is, each week three sites were randomly selected for sampling from among the "other" sites on each segment. During the winter period, 15 samples were taken at each major site, and a total of 15 samples were taken at randomly selected "other" sites on each segment.

Field data were keyed from survey forms (Appendix D) and stored on disk for analysis. Forty-nine different activities were designated as potential stream recreation activities.

Use estimates were made by weighting the information in the sample by its probability of selection and then averaging the three estimates. The basic formula for extrapolating the data is:

$$\text{Estimated visits or hours} = \frac{1}{\text{Sampling probability}} \times \text{Actual visits or hours.}$$

The sampling probability is the product of the station probability (Appendix C), the time of day probability (Appendix B), and the day of the week probability (Appendix B). The station

probability for a Department access site is 1. Three 8-hour periods were sampled each week at Department sites.

For example, during the fall-period week of August 21, 1988, site 1 in the upper segment (Bagnell Dam) was sampled three times: at time period B on Monday and Thursday, and at time period C on Saturday. The numbers of anglers interviewed during those samples were 12, 14, and 27, respectively. The three estimates of angler visits are:

$$\frac{1}{1 \times .6 \times .111} \times 12 = 180.18$$

$$\frac{1}{1 \times .6 \times .111} \times 14 = 210.21$$

$$\frac{1}{1 \times .37 \times .222} \times 27 = 328.707.$$

The estimated number of fishing visits for this 1-week period is:

$$\frac{180.18 + 210.21 + 328.707}{3} = 239.7 \text{ angling visits.}$$

The weekly estimates were totaled to obtain estimates for seasonal periods. Standard errors for the estimates were pooled for seasonal periods.

The summaries for boat type, age, and gender distribution were determined using the empirical data. Average length for fish harvested was calculated from measurements recorded on a separate coding form (Appendix E).

RESULTS

Use estimates were based on information from 17,422 interviews at selected access sites by trained clerks. The lower Osage River was divided into three segments to improve the accuracy of the estimates and provide estimates for different parts of the river. The stations in each segment are listed in Appendix C. Department of Conservation access areas were surveyed separately so use estimates could be made for each area.

Because of sampling problems during the first fall period, some access areas were resampled in a second fall period. Bonnot's Mill in the lower segment was surveyed both fall periods. Although more individuals were surveyed the first fall (328 interviews to 205 interviews), the estimates of visits and hours for high-use activities were similar enough to use the second fall information at accesses where information for a fall period was needed (Table 1).

Table 1. Comparison data from Bonnot's Mill access for fall 1987 and fall 1988

Activity	Visits				Hours			
	Fall 1987		Fall 1988		Fall 1987		Fall 1988	
	Estimate	Std. Err.	Estimate	Std. Err.	Estimate	Std. Err.	Estimate	Std. Err.
Fishing	482	78	650	121	3927	805	9439	2591
Camping-Department	126	73	41	25	3018	1754	976	599
Boating	842	219	808	129	3132	1289	1071	189
Sight-Seeing	397	62	690	110	308	90	225	43
Total	2505	555	2579	235	13409	3209	13290	2817

In general, recreational use--both amount and type--varied from season to season. Little use occurred during the winter, while most hunting activities occurred during the fall, and warm-weather activities occurred during the spring-summer period.

UPPER SEGMENT

Recreational Use

Clerks interviewed 6,967 individuals in the 1.2 mile upper segment from Bagnell Dam to the Federal Highway 54 bridge. Twenty-five activities constituted the total estimated recreational use of 63,052 visits and 294,641 hours (Table 2). Fishing accounted for the most visits (66%), followed by sight seeing (16%). Fishing also was first in hours of use (55%), with camping coming in second (35%).

Each season was summarized separately (Table 3). As expected, summer had the most use, with 66% of the visits. Fishing was the most popular activity in terms of both visits and hours, in all three seasons. Angling was by far the most popular type of fishing; however, many people visited the area below Bagnell Dam for paddlefish snagging in the spring and fall.

While only 12% of the visits occurred during winter, 12% of those were for eagle watching. The bluffs in the upper segment provide a unique opportunity to see eagles in the wild.

Estimates of annual use for each site (Bagnell Dam and "other") in the upper segment were calculated (Tables 4 and 5). Camping at the "other" accesses accounted for a large portion of recreational hours. The Department of Conservation's Bagnell Dam access received 18,308 visits for fishing. This was 78% of all visits to the Bagnell Dam access and 83% of the hours.

Harvest Summary

With fishing the most popular activity, it is not surprising that the estimated fishing harvest was 86,336 fish (Table 6). The harvest rate was .486 fish per hour, or about 1 fish every 2 hours. Channel catfish made up 41% of the harvest, but white bass (19%), bluegill

(14%), and crapple (12%) were also important. Although the paddlefish harvest cannot compare with that of channel catfish, an estimated 1,090 paddlefish were harvested.

User Characteristics

Both males and females from all age categories used the access areas in the upper segment (Table 7). Males accounted for 71% of the participants, a percentage which was consistent across seasons. The majority of males and females were 25 to 44 years old (59% and 48%, respectively). In this segment, 96% of the boats were fishing boats (Table 8).

Table 2. Estimated annual recreational visits and hours for all access sites on the upper segment.*

Activity	Visits			Hours			
	Number	Std. Err.	Percent	Number	Std. Err.	Percent	Ave. visit Length
<u>Fishing</u>							
Angling	38917	2747	62	144482	13328	49	3.7
Trotline	223	122	0	4903	2914	2	22.0
Tournament							
Gigging							
Snagging	2734	328	4	12778	1666	4	4.7
Other Fishing	7	7	0	32	32	0	4.6
Total Fishing	41880	2778	66	162194	14341	55	3.9
<u>Hunting</u>							
Deer - Gun	13	13	0	50	50	0	3.8
Deer - Bow	9	7	0	31	23	0	3.4
Dove							
Rabbit							
Quail							
Waterfowl	42	25	0	224	137	0	5.3
Predator							
Squirrel							
Turkey	8	6	0	35	25	0	4.4
Total Hunting	71	31	0	340	152	0	4.8
Trapping	277	179	0	6643	4306	2	24.0
Camping - Department	11	11	0	262	262	0	23.8
Camping - Other	4325	1180	7	103805	28324	35	24.0
Picnic - Department	373	87	1	410	97	0	1.1
Picnic - Other	511	130	1	900	264	0	1.8
Swimming	36	36	0	73	73	0	2.0
Floating	217	138	0	1509	942	1	7.0
Boating	119	41	0	375	140	0	3.2
Water Skiing							
Nature Study							
Loafing	625	140	1	743	191	0	1.2
Sight Seeing	9775	1228	16	11059	1694	4	1.1
Cottage							
Off-road Vehicles	15	15	0	15	15	0	1.0
Gathering Products	57	41	0	57	41	0	1.0
Collecting Bait	2884	587	5	2314	390	1	0.8
Target Shooting	137	126	0	468	445	0	3.4
Hiking	147	72	0	134	57	0	0.9
Dog Training							
Eagle Watching	1099	337	2	929	247	0	0.8
Undefined Use	15	15	0	45	45	0	3.0
Grand Total	63052	3683		294841	33983		4.7

* Estimates, standard errors, and percentages have been rounded.

Table 3. Seasonal and annual estimated visits and hours for all access sites on the upper segment.*

Activity	Fall		Winter		Spring-Summer		Visits		Hours	
	Visits	Hours	Visits	Hours	Visits	Hours	Number	Std. Err.	Number	Std. Err.
							%			%
<u>Fishing</u>										
Angling	9422	36939	4151	10964	25344	96578	38917	2747	144482	13328
Trotline	32	691			191	4212	223	122	4903	2914
Tournament										
Gigging										
Snagging	538	2320	29	44	2167	10414	2734	328	12778	1666
Other Fishing					7	32	7	7	32	32
Total Fishing	9991	39950	4180	11008	27708	111236	41880	2778	162194	14341
<u>Hunting</u>										
Deer - Gun	13	50					13	13	50	50
Deer - Bow	9	31					9	7	31	23
Dove										
Rabbit										
Quail										
Waterfowl	42	224					42	25	224	137
Predator										
Squirrel										
Turkey	8	35					8	6	35	25
Total Hunting	71	340					71	31	340	152
<u>Trapping</u>										
Camping - Department	130	3123	147	3520			277	179	6643	4306
Camping - Other	411	9857			11	262	11	11	262	262
Picnic - Department	73	76	66	51	3915	93948	4325	1180	103805	28324
Picnic - Other	199	258			234	282	373	87	410	97
					313	642	511	130	900	264

* Estimates, standard errors, and percentages have been rounded. Appendices F, G, and H have seasonal estimates with standard errors.

Table 3. (Continued).*

Activity	Fall		Winter		Spring-Summer		Visits		Total	
	Visits	Hours	Visits	Hours	Visits	Hours	Number	Std. Err.	Number	Std. Err.
								%		%
Swimming					36	73	36	36	73	73
Floating			110	660	107	849	217	138	1509	942
Boating	20	55	11	17	88	303	119	41	375	140
Water Skiing								0		0
Nature Study										
Loafing	222	331	59	44	344	368	625	140	743	191
Sight Seeing	1995	1912	1801	1403	5980	7744	9775	1228	11059	1694
Cottage								16		4
Off-road Vehicle			15	15			15	15	15	15
Gathering Products					57	57	57	41	57	41
Collecting Bait	340	328	59	59	2485	1928	2884	587	2314	390
Target Shooting	125	444			12	24	137	126	468	445
Hiking	39	60	7	4	100	70	147	72	134	57
Dog Training								0		0
Eagle Watching	153	148	935	776	11	5	1099	337	929	247
Undefined Use	15	45					15	15	45	45
Grand Total	13784	56927	7499	18216	41769	219499	63052	3683	294641	33983

* Estimates, standard errors, and percentages have been rounded. Appendices F, G, and H have seasonal estimates with standard errors.

Table 4. Estimated annual recreational visits and hours at Bagnell Dam access in the upper segment.

Activity	Visits			Hours		
	Number	Std. Err.	Percent	Number	Std. Err.	Percent
<u>Fishing</u>						
Angling	15943	1533	68	58483	10369	69
Trotline	184	119	1	3969	2837	4
Tournament						
Gigging						
Snagging	2174	276	9	10370	1357	10
Other Fishing	7	7	0	32	32	0
Total Fishing	18308	1597	78	82854	11579	83
<u>Hunting</u>						
Deer - Gun						
Deer - Bow	3	3	0	13	13	0
Dove						
Rabbit						
Quail						
Waterfowl	42	25	0	224	137	0
Predator						
Squirrel						
Turkey	8	6	0	35	25	0
Total Hunting	52	25	0	271	136	0
Trapping	252	178	1	6043	4264	6
Camping - Department	11	11	0	262	262	0
Camping - Other	120	85	1	2883	2039	3
Picnic - Department	373	87	2	410	97	0
Picnic - Other	18	13	0	30	25	0
Swimming						
Floating	205	138	1	1449	940	1
Boating	119	41	1	375	140	0
Water Skiing						
Nature Study						
Loafing	122	40	1	136	42	0
Sight Seeing	2730	684	12	2524	694	3
Cottage						
Off-road Vehicles	15	15	0	15	15	0
Gathering Products	57	41	0	57	41	0
Collecting Bait	121	75	1	113	49	0
Target Shooting						
Hiking	28	17	0	25	15	0
Dog Training						
Eagle Watching	659	166	3	646	192	1
Undefined Use	15	15	0	45	45	0
Grand Total	23420	1990		99490	12968	

* Estimates, standard errors, and percent of grand total have been rounded.

Table 5. Estimated annual recreational visits and hours at "other" access sites in the upper segment.

Activity	Visits			Hours		
	Number	Std. Err.	Percent*	Number	Std. Err.	Percent*
<u>Fishing</u>						
Angling	22974	2280	58	75998	8374	39
Trotline	39	28	0	934	667	0
Tournament						
Gigging						
Snagging	559	178	1	2408	966	1
Other Fishing						
Total Fishing	23572	2273	59	79340	8461	41
<u>Hunting</u>						
Deer - Gun	13	13	0	50	50	0
Deer - Bow	6	6	0	19	19	0
Dove						
Rabbit						
Quail						
Waterfowl						
Predator						
Squirrel						
Turkey						
Total Hunting	19	19	0	69	69	0
Trapping	25	25	0	601	601	0
Camping - Department						
Camping - Other	4205	1177	11	100922	28250	52
Picnic - Department						
Picnic - Other	494	130	1	870	263	0
Swimming	36	36	0	73	73	0
Floating	12	12	0	61	61	0
Boating						
Water Skiing						
Nature Study						
Loafing	503	135	1	607	186	0
Sight Seeing	7045	1020	18	8535	1545	4
Cottage						
Off-road Vehicles						
Gathering Products						
Collecting Bait	2762	582	7	2202	387	1
Target Shooting	137	126	0	468	445	0
Hiking	118	70	0	109	55	0
Dog Training						
Eagle Watching	440	294	1	282	155	0
Undefined Use						
Grand Total	39632	3100		195151	31412	

* Estimates, standard errors, and percent of grand total have been rounded.

Table 6. Estimated harvest of fish and wildlife from the upper segment.

Fishing					
Species	Estimated Harvest	Standard Error	Harvest per Hour	Percent	Average Length
Largemouth Bass	278	87	.003	0	16.0
Other Black Bass				0	
White Bass	16519	2209	.098	19	12.2
Bluegill	12469	1932	.079	14	5.4
Buffalo	1453	368	.008	2	17.3
Blue Catfish	2088	882	.010	2	20.1
Channel Catfish	35354	5006	.185	41	15.4
Flathead Catfish	48	22	.001	0	14.9
Carp Suckers	83	57	.001	0	14.2
Carp	528	189	.002	1	17.0
Crappie	10518	1633	.060	12	10.0
Drum	5533	959	.030	6	16.3
Striped Bass	288	111	.003	0	15.7
Paddlefish	1090	199	.010	1	29.2
Other Fish	86	30	.002	0	
Total	86336	6188	.486		

Hunting			
Species	Estimated Harvest	Standard Error	Harvest per Hour
Deer			
Dove			
Quail			
Mallard	15	15	.007
Other Ducks			
Turkey			
Rabbit			
Squirrel			

* Estimates, standard errors, and percentages have been rounded.

Table 7. Age and sex composition of participants, in percent, on the upper section.

Season	Age Brackets								Number of Interviews	
	<12	12-15	16-17	18-24	25-34	35-44	45-64	65+	Total	Percent
<u>Male</u>										
Fall	4	3	1	5	33	25	19	10	1183	
Winter	2	4	2	5	39	22	12	15	336	
Spring-Summer	4	5	2	7	37	22	14	10	3455	
Total									4974	
Percent	4	4	2	6	36	23	15	10		71
<u>Female</u>										
Fall	5	4	1	10	27	21	18	15	431	
Winter	14	4		7	24	15	14	22	129	
Spring-Summer	7	7	3	10	30	18	14	11	1433	
Total									1993	
Percent	7	6	2	10	29	19	15	13		29
<u>Combined</u>										
Fall	4	3	1	6	32	24	19	12	1614	
Winter	6	4	1	6	35	20	12	17	465	
Spring-Summer	5	5	2	8	35	21	14	10	4888	
Total									6967	
Percent	5	5	2	7	34	22	15	11		

Table 8. Number and percent of boat types used on the upper segment. The number counted is empirical data, not an estimate.

Boat Type	Number Counted	Percent
Fishing	921	96
Canoe	6	1
Pontoon	1	0
Pleasure	27	3
Rubber		
Kayak		
Other		
Total	955	

MIDDLE SEGMENT

Recreational Use

On the middle segment of the lower Osage River, 2,596 individuals were interviewed. This segment is 15.4 miles long and starts at the Federal Highway 54 bridge and ends at the town of Tuscumbia. It is more isolated than the other two segments, which may account for the lower amount of use and fewer types of activities measured. Only 20 of the 36 activities were recorded on the middle segment. An estimated 32,757 visits and 274,420 hours were recorded (Table 9). Again, fishing accounted for the most visits (48%), followed by camping (22%) and sight seeing (26%). Even though fishing had the most visits, camping hours were higher (65%).

Sixty-three percent of the visits occurred during the summer and only 4% in the winter (Table 10). Trapping and waterfowl hunting visits and hours in the fall were higher on the middle segment than on the upper segment.

Use was higher at the "other" sites on the middle segment (71% of the visits), than at the Tuscumbia access (Tables 11 and 12). Camping accounted for 74% of the hours at the "other" sites. The majority of fishing visits on the middle segment also ended at these "other" accesses; these visits amounted to 11,206 of the 15,790 total estimated fishing visits for the middle segment. Snagging also occurred in this segment, although not to the extent that it occurred on the upper segment. At the Tuscumbia access, 48% of the visits were for fishing.

Harvest Summary

As on the upper segment, channel catfish was the most harvested species. Sixty percent of the estimated 22,652 fish harvested were channel catfish (Table 13). The harvest

rate for all fish was .333 fish per hour, or 1 fish every 3 hours. White bass, bluegill, and crappie also contributed to the harvest.

User Characteristics

The middle segment's users were similar to those in the upper segment. Seventy-five percent were male (Table 14). The age category with the most users was 25 to 44; 52% of men were in this category and 48% of the women. Thirteen percent of the females were under 16 years old, while only 5% of the males were in this category. Ninety-seven percent of the boats were in the fishing boat category (Table 15).

Table 9. Estimated annual recreational visits and hours for all access sites on the middle segment.*

Activity	Visits			Hours			
	Number	Std. Err.	Percent	Number	Std. Err.	Percent	Ave. visit Length
<u>Fishing</u>							
Angling	13797	1394	42	44560	5415	16	3.2
Trotline	1228	355	4	24397	8001	9	19.9
Tournament							
Gigging							
Snagging	766	280	2	2788	1143	1	3.6
Other Fishing							
Total Fishing	15790	1501	48	71745	10411	26	4.5
<u>Hunting</u>							
Deer - Gun	3	3	0	5	5	0	1.7
Deer - Bow							
Dove							
Rabbit							
Quail							
Waterfowl	304	62	1	1254	264	0	4.1
Predator							
Squirrel	55	36	0	212	146	0	3.9
Turkey							
Total Hunting	362	84	1	1472	333	1	4.1
Trapping	327	194	1	7831	4561	3	23.9
Camping - Department	459	318	1	10875	7641	4	23.7
Camping - Other	7023	1071	21	168347	25691	61	24.0
Picnic - Department	16	16	0	16	16	0	1.0
Picnic - Other	83	83	0	334	334	0	4.0
Swimming	91	50	0	102	54	0	1.1
Floating	76	48	0	336	301	0	4.4
Boating	768	263	2	2357	1343	1	3.1
Water Skiing							
Nature Study							
Loafing	1641	245	5	1797	604	1	1.1
Sight Seeing	3614	630	11	3787	1226	1	1.0
Cottage	50	30	0	1189	724	0	23.8
Off-road Vehicles	11	11	0	11	11	0	1.0
Gathering Products	79	35	0	67	34	0	0.8
Collecting Bait							
Target Shooting							
Hiking							
Dog Training							
Eagle Watching							
Undefined Use	2321	982	7	3604	1528	1	1.6
Grand Total	32757	2576		274420	30359		8.4

* Estimates, standard errors, and percentages have been rounded.

Table 10. Seasonal and annual estimated visits and hours for all access sites on the middle segment.*

Activity	Fall		Winter		Spring-Summer		Visits		Hours	
	Visits	Hours	Visits	Hours	Visits	Hours	Number	Std. Err.	Number	Std. Err.
							%		%	
<u>Fishing</u>										
Angling	2439	6841	370	876	10987	36842	13797	1394	44560	5415
Trotline	145	2017	7	22	1076	22358	1228	355	24397	8001
Tournament										
Gigging										
Snagging	263	1079			503	1708	766	280	2788	1143
Other Fishing										
Total Fishing	2847	9938	378	898	12565	60907	15790	1501	71745	10411
<u>Hunting</u>										
Deer - Gun	3	5					3	3	5	5
Deer - Bow										
Dove										
Rabbit										
Quail										
Waterfowl	304	1254					304	62	1254	264
Predator										
Squirrel	55	212					55	36	212	146
Turkey										
Total Hunting	362	1472					362	84	1472	333
<u>Trapping</u>										
Camping - Department	257	6159	70	1672			327	194	7831	4661
Camping - Other	10	100			449	10774	459	318	10875	7641
Picnic - Department	3116	74686			3910	93662	7023	1071	168347	25691
Picnic - Other					16	16	16	16	16	16
					83	334	83	83	334	334

* Estimates, standard errors, and percentages have been rounded. Appendices I, J, and K have seasonal estimates with standard errors.

Table 10. (Continued).*

Activity	Fall		Winter		Spring-Summer		Visits			Hours			Total
	Visits	Hours	Visits	Hours	Visits	Hours	Number	Std. Err.	%	Number	Std. Err.	%	
Swimming					91	102	91	50	0	102	54	0	
Floating					76	336	76	48	0	336	301	0	
Boating	101	128	131	264	536	1965	768	263	2	2357	1343	1	
Water Skiing													
Nature Study													
Loafing	418	252	44	42	1180	1502	1641	245	5	1797	604	1	
Sight Seeing	1527	1042	835	577	1252	2168	3614	630	11	3787	1226	1	
Cottage					50	1189	50	30	0	1189	724	0	
Off-road Vehicle					11	11	11	11	0	11	11	0	
Gathering Products					79	67	79	35	0	67	34	0	
Collecting Bait													
Target Shooting													
Hiking													
Dog Training													
Eagle Watching	.												
Undefined Use	2111	3318			210	286	2321	982	7	3604	1528	1	
Grand Total	10773	97112	1457	3454	20526	179855	32757	2576		274420	30359		

* Estimates, standard errors, and percentages have been rounded. Appendices I, J, and K have seasonal estimates with standard errors.

Table 11. Estimated annual recreational visits and hours at Tuscumbia access in the middle segment.*

Activity	Visits			Hours		
	Number	Std. Err.	Percent	Number	Std. Err.	Percent
<u>Fishing</u>						
Angling	4248	601	44	12932	2075	42
Trotline	336	182	3	5863	3531	19
Tournament						
Gigging						
Snagging						
Other Fishing						
Total Fishing	4584	705	48	18794	5003	61
<u>Hunting</u>						
Deer - Gun	3	3	0	5	5	0
Deer - Bow						
Dove						
Rabbit						
Quail						
Waterfowl	252	50	3	1049	215	3
Predator						
Squirrel	42	34	0	150	131	0
Turkey						
Total Hunting	297	75	3	1204	289	4
Trapping	294	192	3	7047	4619	23
Camping - Department	10	10	0	100	100	0
Camping - Other						
Picnic - Department	16	16	0	16	16	0
Picnic - Other						
Swimming	91	50	1	102	54	0
Floating	54	42	1	314	301	1
Boating	247	54	3	424	111	1
Water Skiing						
Nature Study						
Loafing	1247	183	13	974	139	3
Sight Seeing	2583	515	27	1868	359	6
Cottage						
Off-road Vehicles	11	11	0	11	11	0
Gathering Products	79	35	1	67	34	0
Collecting Bait						
Target Shooting						
Hiking						
Dog Training						
Eagle Watching						
Undefined Use	106	69	1	61	37	0
Grand Total	9643	1126		30999	6938	

* Estimates, standard errors, and percent of grand total have been rounded.

Table 12. Estimated annual recreational visits and hours at "other" access sites in the middle segment.*

Activity	Visits			Hours		
	Number	Std. Err.	Percent	Number	Std. Err.	Percent
<u>Fishing</u>						
Angling	9548	1257	41	31628	5002	13
Trotline	892	305	4	18565	7180	8
Tournament						
Gigging						
Snagging	766	280	3	2788	1143	1
Other Fishing						
Total Fishing	11206	1324	48	52950	9130	22
<u>Hunting</u>						
Deer - Gun						
Deer - Bow						
Dove						
Rabbit						
Quail						
Waterfowl	52	37	0	205	153	0
Predator						
Squirrel	13	13	0	63	63	0
Turkey						
Total Hunting	66	39	0	268	166	0
Trapping	33	26	0	784	628	0
Camping - Department	449	318	2	10774	7640	4
Camping - Other	7023	1071	30	168347	25691	69
Picnic - Department						
Picnic - Other	83	83	0	334	334	0
Swimming						
Floating	22	22	0	22	22	0
Boating	520	257	2	1933	1338	1
Water Skiing						
Nature Study						
Loafing	395	163	2	823	588	0
Sight Seeing	1031	362	4	1919	1172	1
Cottage	50	30	0	1189	724	0
Off-road Vehicles						
Gathering Products						
Collecting Bait						
Target Shooting						
Hiking						
Dog Training						
Eagle Watching						
Undefined Use	2215	980	10	3542	1528	1
Grand Total	23114	2317		243421	29556	

* Estimates, standard errors, and percent of grand total have been rounded.

Table 13. Estimated harvest of fish and wildlife from the middle segment. Estimates have been rounded.

Fishing					
Species	Estimated Harvest	Standard Error	Harvest per Hour	Percent	Average Length
Largemouth Bass	287	96	.008	1	14.5
Other Black Bass	24	17	.018	0	13.2
White Bass	1377	363	.028	6	12.4
Bluegill	1760	566	.023	8	5.5
Buffalo	324	120	.006	1	18.4
Blue Catfish	1245	392	.034	6	15.4
Channel Catfish	13480	2870	.187	60	15.5
Flathead Catfish	122	66	.005	1	20.9
Carp Suckers	803	470	.034	4	15.0
Carp	132	58	.003	1	16.3
Crappie	1840	556	.028	8	7.8
Drum	443	144	.010	2	15.0
Striped Bass	24	17	.004	0	30.0
Paddlefish	734	224	.027	3	27.2
Other Fish	58	37	.009	0	
Total	22652	3078	.333		

Hunting			
Species	Estimated Harvest	Standard Error	Harvest per Hour
Deer	8	8	.167
Dove			
Quail			
Mallard	487	63	.206
Other Ducks	28	21	.206
Turkey			
Rabbit			
Squirrel	311	311	.147

* Estimates, standard errors, and percentages have been rounded.

Table 14. Age and sex composition of participants, in percent, on the middle section.

Season	<u>Age Brackets</u>								<u>Number of Interviews</u>	
	<12	12-15	16-17	18-24	25-34	35-44	45-64	65+	Total	Percent
<u>Male</u>										
Fall	3	2		9	31	17	29	9	506	
Winter	5	1		11	33	26	15	10	82	
Spring-Summer	3	2	1	9	32	21	25	6	1356	
Total									1944	
Percent	3	2	1	9	32	20	26	7		75
<u>Female</u>										
Fall	7	3	1	13	23	18	23	12	195	
Winter	19	5		19	33	50	10	10	21	
Spring-Summer	8	6	1	12	33	18	19	4	436	
Total									652	
Percent	8	5	1	13	30	18	19	7		25
<u>Combined</u>										
Fall	4	2	0	10	29	17	27	10	701	
Winter	8	2		13	33	21	14	10	103	
Spring-Summer	4	3	1	10	32	20	23	6	1792	
Total									2596	
Percent	4	3	1	10	31	20	24	7		

Table 15. Number and percent of boat types used on the middle segment.

Boat Type	Number Counted	Percent
Fishing	658	97
Canoe	18	3
Pontoon	1	0
Pleasure	3	0
Rubber		
Kayak		
Other		
Total	680	

LOWER SEGMENT

Recreational Use

The lower segment of the lower Osage River was the longest of the three segments at 65 miles. Clerks contacted 7,859 individuals in this segment, which ran from the town of Tuscumbia to the Osage River's confluence with the Missouri River. All 36 activities were recorded, with estimated visits at 67,358 and estimated hours at 390,511 (Table 16). Use on the lower segment was only slightly higher than on the much shorter upper segment, with 67,358 visits compared to 63,050 visits on the upper segment. Fishing was the most popular activity in terms of both estimated visits (27%) and estimated hours (41%). Boating was second in terms of estimated visits (19%), followed by sight seeing (14%). Twenty-six percent of the estimated hours were spent camping. Hunting accounted for more visits on this segment than the other two segments combined. Four percent of the estimated visits on the lower segment were hunting visits. As expected, summer had the most visits, with 48,691 or 72% (Table 17).

Five Department of Conservation sites were surveyed separately on the lower segment. Estimated visits ranged from 6,985 at the Osage Tavern access, or 10% of the visits on the lower segment, to 12,487 at Mariosa access, or 19% of the visits (Tables 18 through 22). The "other" accesses (6 sites) had 20,006 estimated visits or 30% of the total visits on the lower segment (Table 23). Water-related activities, including fishing, boating, and swimming, had high use at all the Department of Conservation access areas. Sight seeing was an important activity at all these accesses except Pike's Camp and Osage Tavern.

Harvest Summary

Only 13% of the total fish harvested in this study were from the lower segment. The estimated fish harvest was 15,935 fish, with a harvest rate of .1 fish per hour, or 1 fish every

10 hours (Table 24). Bluegill was the most-harvested species at 21% of the total harvest. Channel catfish, drum, buffalo, largemouth bass, and the "other" fish categories were also important. Included in the "other" fish category are sturgeon and walleye. Squirrel and dove harvests were higher on the lower segment than on the other two segments.

User Characteristics

As with the other two segments, the majority (71%) of participants were male (Table 25). The age categories for men were consistent with the other two segments, with 50% being 25 to 44 years old. Of women, 33% were 25 to 44 years old and 22% were 18 to 24. A greater percentage of participants in the lower segment were less than 16 years old; 16% of males and 23% of females were in this age category. Pleasure boats were used more on this segment than on the other two segments, with 16% of the boats classified as pleasure boats (Table 26). However, fishing boats still made up 82% of the seven boat types recorded.

Table 16. Estimated annual recreational visits and hours for all access sites on the lower segment.*

Activity	Visits			Hours			
	Number	Std. Err.	Percent	Number	Std. Err.	Percent	Ave. visit Length
Fishing							
Angling	11735	864	17	39029	2472	10	3.3
Trotline	5377	583	8	117913	13008	30	21.9
Tournament	247	128	0	1799	963	0	7.3
Gigging	269	75	0	989	296	0	3.7
Snagging	341	249	1	692	489	0	2.0
Other Fishing	11	11	0	262	262	0	23.8
Total Fishing	17980	1085	27	160685	13150	41	8.9
Hunting							
Deer - Gun	189	87	0	714	313	0	3.8
Deer - Bow	91	44	0	352	192	0	3.9
Dove	23	23	0	46	46	0	2.0
Rabbit	79	34	0	139	67	0	1.8
Quail	83	44	0	100	61	0	1.6
Waterfowl	59	23	0	282	113	0	4.8
Predator	5	5	0	167	167	0	33.4
Squirrel	128	57	0	293	122	0	2.3
Turkey	191	131	0	615	479	0	3.2
Total Hunting	827	187	1	2708	659	1	3.3
Trapping	509	159	1	7403	3039	2	14.5
Camping - Department	1879	306	3	42225	6717	11	22.5
Camping - Other	2295	723	3	54836	17345	14	23.9
Picnic - Department	1504	237	2	5725	1830	1	3.8
Picnic - Other	1251	393	2	5501	1968	1	4.4
Swimming	7696	1172	11	17403	2906	4	2.3
Floating	328	161	0	1263	523	0	3.9
Boating	12524	957	19	34688	3408	9	2.8
Water Skiing	3608	565	5	15041	2963	4	4.2
Nature Study	52	34	0	433	391	0	8.3
Loafing	1731	241	3	2098	505	1	1.2
Sight Seeing	9271	746	14	5893	524	2	0.6
Cottage	862	519	1	20290	12457	5	23.5
Off-road Vehicles	268	100	0	343	196	0	1.3
Gathering Products	609	217	1	923	404	0	1.5
Collecting Bait	137	66	0	142	66	0	1.0
Target Shooting	48	30	0	51	32	0	1.1
Hiking	163	58	0	234	114	0	1.4
Dog Training	184	127	0	302	226	0	1.6
Eagle Watching	81	58	0	81	58	0	1.0
Undefined Use	2551	1084	4	7619	5272	2	3.0
Grand Total	67358	3822		390511	30533		5.8

* Estimates, standard errors, and percentages have been rounded.

Table 17. Seasonal and annual estimated visits and hours for all access sites on the lower segment.*

Activity	Fall		Winter		Spring-Summer		Visits		Hours	
	Visits	Hours	Visits	Hours	Visits	Hours	Number	Std. Err.	%	Total
<u>Fishing</u>										
Angling	2763	10730	125	213	8847	28086	11735	864	17	39029 2472 10
Trotline	1436	29120			3941	88793	5377	583	8	117913 13008 30
Tournament					247	1799	247	128	0	1799 963 0
Gigging	269	989					269	75	0	989 296 0
Snagging					341	692	341	249	1	692 489 0
Other Fishing					11	262	11	11	0	262 262 0
Total Fishing	4469	40839	125	213	13387	119633	17980	1085	27	160685 13150 41
<u>Hunting</u>										
Deer - Gun	189	714					189	87	0	714 313 0
Deer - Bow	70	310	21	42			91	44	0	352 192 0
Dove	23	46					23	23	0	46 46 0
Rabbit	10	20	69	119			79	34	0	139 67 0
Quail	21	48	42	52			63	44	0	100 61 0
Waterfowl	59	282					59	23	0	282 113 0
Predator					5	167	5	5	0	167 167 0
Squirrel	95	220			32	72	128	57	0	293 122 0
Turkey	82	151			109	464	191	131	0	615 479 0
Total Hunting	548	1791	131	214	147	704	827	187	1	2708 659 1
<u>Trapping</u>										
Camping - Department	296	4540	186	2850	27	13	509	159	1	7403 3039 2
Camping - Other	448	10103			1431	32122	1879	306	3	42225 6717 11
Picnic - Department	369	8761			1926	46075	2295	723	3	54836 17345 14
Picnic - Other	451	848			1052	4877	1504	237	2	5725 1830 1
	269	1359			983	4142	1251	393	2	5501 1968 1

* Estimates, standard errors, and percentages have been rounded. Appendices L, M, and N have seasonal estimates with standard errors.

Table 17. (Continued).*

Activity	Fall		Winter		Spring-Summer		Total		
	Visits	Hours	Visits	Hours	Visits	Hours	Number	Std. Err.	%
Swimming	575	941			7121	16462	7696	1172	11
Floating	53	340			276	923	328	161	0
Boating	2640	6251	264	392	9620	28046	12524	957	19
Water Skiing	510	1567			3099	13474	3608	565	5
Nature Study	45	418			7	15	52	34	0
Loafing	765	1001	70	59	897	1038	1731	241	3
Sight Seeing	2614	2176	1248	4224	5410	3295	9271	746	14
Cottage	283	5502	73	1760	506	12028	862	519	1
Off-road Vehicle	13	13	22	11	234	320	268	100	0
Gathering Products	271	234	7	4	330	686	609	217	1
Collecting Bait					137	142	137	66	0
Target Shooting	5	8			43	44	48	30	0
Hiking	99	136			64	98	163	58	0
Dog Training	143	232			41	70	184	127	0
Eagle Watching	.		37	37	44	44	81	58	0
Undefined Use	559	750	1048	5239	944	1630	2551	1084	4
Grand Total	15457	88839	3210	11199	48691	290473	67358	3822	
							390511		30533

* Estimates, standard errors, and percentages have been rounded. Appendices L, M, and N have seasonal estimates with standard errors.

Table 18. Estimated annual recreational visits and hours at Bonnot's Mill access in the lower segment.*

Activity	Visits			Hours		
	Number	Std. Err.	Percent	Number	Std. Err.	Percent
<u>Fishing</u>						
Angling	1249	127	14	4103	417	10
Trotline	535	100	6	12824	2401	32
Tournament						
Gigging	16	16	0	45	45	0
Snagging	35	21	0	79	48	0
Other Fishing						
Total Fishing	1836	155	20	17051	2367	43
<u>Hunting</u>						
Deer - Gun						
Deer - Bow						
Dove						
Rabbit						
Quail						
Waterfowl						
Predator						
Squirrel	10	10	0	15	15	0
Turkey						
Total Hunting	10	10	0	15	15	0
Trapping	36	12	0	855	219	2
Camping - Department	182	80	2	4364	1926	11
Camping - Other	40	17	0	953	405	2
Picnic - Department	268	91	3	837	292	2
Picnic - Other	103	39	1	352	142	1
Swimming	1124	237	12	2849	642	7
Floating						
Boating	2913	297	32	8690	1484	22
Water Skiing	681	188	8	2627	780	7
Nature Study						
Loafing	242	52	3	281	78	1
Sight Seeing	1388	165	15	746	118	2
Cottage						
Off-road Vehicles	69	28	1	20	8	0
Gathering Products	13	9	0	8	5	0
Collecting Bait						
Target Shooting	5	5	0	8	8	0
Hiking						
Dog Training						
Eagle Watching						
Undefined Use	145	38	2	236	87	1
Grand Total	9053	814		39892	4406	

* Estimates, standard errors, and percent of grand total have been rounded.

Table 19. Estimated annual recreational visits and hours at Mariosa access in the lower segment.*

Activity	Visits			Hours		
	Number	Std. Err.	Percent	Number	Std. Err.	Percent
<u>Fishing</u>						
Angling	2313	184	19	8261	781	15
Trotline	976	274	8	22901	6546	40
Tournament						
Gigging	134	55	1	483	194	1
Snagging	49	34	0	102	73	0
Other Fishing						
Total Fishing	3471	331	28	31755	6570	56
<u>Hunting</u>						
Deer - Gun	5	5	0	63	63	0
Deer - Bow						
Dove						
Rabbit	7	7	0	4	4	0
Quail						
Waterfowl						
Predator						
Squirrel						
Turkey						
Total Hunting	12	9	0	66	639	0
Trapping	47	13	0	1084	341	2
Camping - Department	292	69	2	6654	1524	12
Camping - Other	22	14	0	279	185	0
Picnic - Department	687	151	6	1424	340	3
Picnic - Other	17	17	0	83	83	0
Swimming	1206	250	10	2249	489	4
Floating	23	18	0	108	931	0
Boating	3011	423	24	6654	1249	12
Water Skiing	797	241	6	2938	1052	5
Nature Study						
Loafing	2067	56	17	224	101	0
Sight Seeing	1850	327	15	839	130	1
Cottage	38	25	0	512	351	1
Off-road Vehicles	15	15	0	7	7	0
Gathering Products	58	23	0	39	17	0
Collecting Bait						
Target Shooting						
Hiking	45	22	0	79	81	0
Dog Training	21	13	0	13	9	0
Eagle Watching						
Undefined Use	390	90	3	893	408	2
Grand Total	12487	1069	56602	56602	7575	

* Estimates, standard errors, and percent of grand total have been rounded.

Table 20. Estimated annual recreational visits and hours at Pike's Camp access in the lower segment.*

Activity	Visits			Hours		
	Number	Std. Err.	Percent	Number	Std. Err.	Percent
<u>Fishing</u>						
Angling	1540	227	16	6603	1374	13
Trotline	883	143	9	20457	3388	40
Tournament	154	110	2	1215	865	2
Gigging	32	32	0	114	114	0
Snagging	8	8	0	23	23	0
Other Fishing						
Total Fishing	2618	313	27	28612	3847	56
<u>Hunting</u>						
Deer - Gun	27	23	0	93	84	0
Deer - Bow	18	13	0	56	40	0
Dove						
Rabbit	50	25	1	104	59	0
Quail	21	13	0	48	31	0
Waterfowl						
Predator						
Squirrel	3	3	0	5	5	0
Turkey	10	10	0	36	36	0
Total Hunting	128	43	1	342	124	1
Trapping						
Camping - Department	61	37	1	1397	866	3
Camping - Other	82	51	1	1973	1227	4
Picnic - Department	373	130	4	1290	582	3
Picnic - Other	93	93	1	534	534	1
Swimming	2370	479	24	5376	1588	11
Floating	53	53	1	254	254	1
Boating	1389	341	14	3331	1109	7
Water Skiing	1013	318	10	4770	2096	9
Nature Study	23	18	0	405	390	1
Loafing	179	59	2	132	71	0
Sight Seeing	577	89	6	303	64	1
Cottage	20	20	0	480	480	1
Off-road Vehicles						
Gathering Products	157	58	2	248	86	0
Collecting Bait						
Target Shooting	5	5	0	1	1	0
Hiking	45	19	0	37	16	0
Dog Training	163	126	2	288	226	1
Eagle Watching						
Undefined Use	135	37	1	117	40	0
Grand Total	9777	1534		50724	8208	

* Estimates, standard errors, and percent of grand total have been rounded.

Table 21. Estimated annual recreational visits and hours at St. Thomas access in the lower segment.*

Activity	Visits			Hours		
	Number	Std. Err.	Percent	Number	Std. Err.	Percent
<u>Fishing</u>						
Angling	1333	148	15	4770	816	9
Trotline	1125	210	12	25332	5077	46
Tournament	93	67	1	584	423	1
Gigging	32	23	0	57	41	0
Snagging						
Other Fishing						
Total Fishing	2583	263	29	30743	5181	56
<u>Hunting</u>						
Deer - Gun						
Deer - Bow						
Dove						
Rabbit						
Quail						
Waterfowl	39	18	0	177	84	0
Predator	5	5	0	167	167	0
Squirrel	65	26	1	173	68	0
Turkey						
Total Hunting	109	33	1	517	201	1
Trapping	21	9	0	342	201	1
Camping - Department	7	7	0	160	160	0
Camping - Other	366	98	4	8788	2355	16
Picnic - Department	53	28	1	209	142	0
Picnic - Other	282	109	3	811	322	1
Swimming	475	166	5	1506	594	3
Floating	20	20	0	105	105	0
Boating	1972	403	22	6248	1592	11
Water Skiing	727	275	8	3258	1350	6
Nature Study						
Loafing	404	60	4	391	78	1
Sight Seeing	1703	263	19	1081	199	2
Cottage						
Off-road Vehicles						
Gathering Products	32	19	0	85	44	0
Collecting Bait						
Target Shooting						
Hiking						
Dog Training						
Eagle Watching						
Undefined Use	297	61	3	304	70	1
Grand Total	9051	1086		54530	7296	

* Estimates, standard errors, and percent of grand total have been rounded.

Table 22. Estimated annual recreational visits and hours at Osage Tavern access in the lower segment.*

Activity	Visits			Hours		
	Number	Std. Err.	Percent	Number	Std. Err.	Percent
<u>Fishing</u>						
Angling	1492	174	21	6152	600	9
Trotline	943	254	14	18583	5980	28
Tournament						
Gigging	54	29	1	291	183	0
Snagging	3	3	0	8	8	0
Other Fishing	11	11	0	262	262	0
Total Fishing	2503	302	36	25296	5852	38
<u>Hunting</u>						
Deer - Gun						
Deer - Bow						
Dove						
Rabbit						
Quail						
Waterfowl	20	14	0	105	74	0
Predator						
Squirrel						
Turkey						
Total Hunting	20	14	0	105	74	0
Trapping	47	29	1	103	54	0
Camping - Department	1338	285	19	29650	8190	44
Camping - Other						
Picnic - Department	123	87	2	1966	1670	3
Picnic - Other	203	203	3	1217	1217	2
Swimming	410	140	6	1047	505	2
Floating	33	15	0	235	139	0
Boating	1029	181	15	3002	645	5
Water Skiing	8	8	0	16	16	0
Nature Study						
Loafing	222	53	3	342	100	1
Sight Seeing	654	137	9	654	132	1
Cottage						
Off-road Vehicles	91	62	1	222	182	0
Gathering Products						
Collecting Bait	5	5	0	11	11	0
Target Shooting	10	10	0	15	15	0
Hiking	26	19	0	26	19	0
Dog Training						
Eagle Watching						
Undefined Use						
Grand Total	6985	718		66746	9977	

* Estimates, standard errors, and percent of grand total have been rounded.

Table 23. Estimated annual recreational visits and hours at the "other" access sites in the lower segment.*

Activity	Visits			Hours		
	Number	Std. Err.	Percent	Number	Std. Err.	Percent
<u>Fishing</u>						
Angling	3808	770	19	8941	15549	7
Trotline	915	355	5	17806	6898	15
Tournament						
Gigging						
Snagging	248	248	1	480	480	0
Other Fishing						
Total Fishing	4968	886	25	27227	6948	22
<u>Hunting</u>						
Deer - Gun	157	83	1	558	295	0
Deer - Bow	73	42	0	296	188	0
Dove	23	23	0	46	46	0
Rabbit	21	21	0	31	31	0
Quail	42	42	0	52	52	0
Waterfowl	42	25	0	224	137	0
Predator						
Squirrel	50	50	0	100	100	0
Turkey	181	131	1	579	478	0
Total Hunting	547	178	3	1663	607	1
Trapping	358	155	2	5018	2999	4
Camping - Department						
Camping - Other	1785	714	9	42843	17135	35
Picnic - Department						
Picnic - Other	553	301	3	2503	1406	2
Swimming	2111	989	11	4375	2160	4
Floating	199	149	1	5619	412	5
Boating	2211	581	11	6764	1918	6
Water Skiing	382	221	2	1429	920	1
Nature Study	29	29	0	29	29	0
Loafing	478	206	2	728	466	1
Sight Seeing	3100	571	16	2271	427	2
Cottage	804	518	4	19297	12443	16
Off-road Vehicles	94	72	0	94	72	0
Gathering Products	349	211	2	563	392	0
Collecting Bait	131	66	1	131	66	0
Target Shooting	27	27	0	27	27	0
Hiking	46	46	0	93	93	0
Dog Training						
Eagle Watching	81	58	0	81	58	0
Undefined Use	1585	1077	8	6068	5255	5
Grand Total	20006	2958		122018	25206	

* Estimates, standard errors, and percent of grand total have been rounded.

Table 24. Estimated harvest of fish and wildlife from the lower segment.*

Fishing					
Species	Estimated Harvest	Standard Error	Harvest per Hour	Percent	Average Length
Largemouth Bass	1272	340	.011	8	14.2
Other Black Bass	164	48	.002	1	13.0
White Bass	188	90	.005	1	11.9
Bluegill	3299	626	.027	21	5.5
Buffalo	1736	261	.012	11	16.6
Blue Catfish	364	109	.003	2	19.3
Channel Catfish	2241	286	.016	14	16.2
Flathead Catfish	213	81	.001	1	20.7
Carp Suckers	1059	307	.006	7	13.8
Carp	708	206	.004	4	17.5
Crappie	673	197	.008	4	8.0
Drum	1897	374	.014	12	12.9
Striped Bass	49	35	.002	0	16.8
Paddlefish	202	165	.003	1	26.6
Other Fish	1870	1457	.006	12	
Total	15935	1784	.101		

Hunting			
Species	Estimated Harvest	Standard Error	Harvest per Hour
Deer	15	0	.019
Dove	139	0	.333
Quail	30	0	.076
Mallard	101	2	.068
Other Ducks			
Turkey	97	5	.032
Rabbit	29	22	.164
Squirrel	239	10	.185

* Estimates, standard errors, and percentages have been rounded.

Table 25. Age and sex composition of participants, in percent, on the lower section.

Season	<u>Age Brackets</u>								<u>Number of Interviews</u>	
	<12	12-15	16-17	18-24	25-34	35-44	45-64	65+	Total	Percent
<u>Male</u>										
Fall	8	3	1	12	25	16	20	18	1318	
Winter	7			12	40	12	14	15	151	
Spring-Summer	13	5	4	19	26	13	13	7	4111	
Total									5580	
Percent	11	5	3	17	26	14	15	10		71
<u>Female</u>										
Fall	16	3	2	15	20	12	19	13	409	
Winter	5	5		47	16	16		11	19	
Spring-Summer	16	7	5	24	21	12	10	5	1851	
Total									2279	
Percent	16	7	4	22	21	12	11	7		29
<u>Combined</u>										
Fall	9	3	1	13	24	15	20	16	1727	
Winter	7	1		16	37	12	12	15	170	
Spring-Summer	14	6	4	20	24	13	12	6	5962	
Total									7859	
Percent	13	5	3	19	24	13	14	9		

Table 26. Number and percent of boat types used on the middle segment.

Boat Type	Number Counted	Percent
Fishing	1373	82
Canoe	7	0
Pontoon	11	1
Pleasure	271	16
Rubber	4	0
Kayak	1	0
Other	7	0
Total	1,674	

ALL SEGMENTS

Recreational Use

Total recreational use for the lower Osage River was determined from the 17,422 interviews on the three segments. Pooling the estimates from the three segments places estimated visits at 163,168 and estimated hours at 959,573 (Table 27). Fishing was by far the most important of the 36 activities recorded, with 46% of the visits and 41% of the hours. Sight seeing and camping were also important; sight seeing had 14% of the visits and camping 40% of the hours. Sixty-eight percent of all visits and 71% of all fishing occurred during the summer (Table 28).

Harvest Summary

At least 14 species of fish were harvested in the lower Osage River during the study (Table 29). Estimated harvest was 124,922 fish, with a harvest rate of .277 fish per hour, or about 1 fish every 4 hours. Channel catfish was the most harvested species at 51,075 fish or 41% of the total harvest. White bass, bluegill, and crappie were also important. Waterfowl and squirrel were the most-harvested wildlife.

User Characteristics

As might be expected, this survey documented the majority (72%) of participants in recreational activities as male (Table 30). The majority of participants, both men and women, were between 25 and 44 years old (49% and 47%, respectively), with several in the under-16 age category (11% male, 17% female). Fishing boats, as 89% of all boats, dominated the 7 boat types measured (Table 31).

Weather Conditions

Weather conditions were recorded for each of the 1,380 samples. Fifty percent of the days were clear, 9% had rain, 18% were cloudy, and 16% had scattered clouds. The wind

was usually calm (47% of the days), with 28% of the days having a slight breeze, 18% moderate winds, and 7% strong winds.

Water level fluctuations of the river were also recorded. Over half the samples (52%) were collected during a steady water level. Eleven percent were collected when the water level was rising and 20% when it was falling; the rest were collected when the water level both rose and fell during the sample.

Table 27. Estimated annual recreational visits and hours for all access sites on lower Osage River.*

Activity	Visits			Hours			
	Number	Std. Err.	Percent	Number	Std. Err.	Percent	Ave. visit Length
<u>Fishing</u>							
Angling	64448	3200	40	228070	14597	24	3.5
Trotline	6828	694	4	147213	15547	15	21.6
Tournament	247	128	0	1799	983	0	7.3
Gigging	269	75	0	989	298	0	3.7
Snagging	3840	498	2	16258	2079	2	4.2
Other Fishing	18	13	0	294	264	0	16.3
Total Fishing	75650	3339	46	394623	22068	41	5.2
<u>Hunting</u>							
Deer - Gun	204	88	0	769	317	0	3.8
Deer - Bow	100	45	0	384	193	0	3.8
Dove	23	23	0	46	46	0	2.0
Rabbit	79	34	0	139	67	0	1.8
Quail	63	44	0	100	61	0	1.6
Waterfowl	405	71	0	1760	318	0	4.3
Predator	5	5	0	167	167	0	33.4
Squirrel	183	68	0	505	190	0	2.8
Turkey	198	131	0	650	480	0	3.3
Total Hunting	1259	208	1	4520	754	0	3.6
Trapping	1113	309	1	21878	7036	2	19.7
Camping - Department	2349	442	1	53362	10177	6	22.7
Camping - Other	13643	1750	8	326988	41990	34	24.0
Picnic - Department	1893	253	1	6151	1833	1	3.2
Picnic - Other	1846	422	1	6735	2014	1	3.6
Swimming	7823	1173	5	17577	2908	2	2.2
Floating	621	218	0	3108	1118	0	5.0
Boating	13411	994	8	37420	3665	4	2.8
Water Skiing	3608	565	2	15041	2963	2	4.2
Nature Study	52	34	0	433	391	0	8.3
Loafing	3998	371	2	4638	810	0	1.2
Sight Seeing	22660	1569	14	20739	2155	2	0.9
Cottage	912	520	1	21479	12478	2	23.6
Off-road Vehicles	294	102	0	369	197	0	1.3
Gathering Products	745	223	0	1047	408	0	1.4
Collecting Bait	3020	591	2	2456	395	0	0.8
Target Shooting	185	129	0	520	446	0	2.8
Hiking	309	92	0	368	127	0	1.2
Dog Training	184	127	0	302	226	0	1.6
Eagle Watching	1180	342	1	1010	353	0	0.9
Undefined Use	4887	1463	3	11268	5489	1	2.3
Grand Total	163168	5900		959573	54853		5.9

* Estimates, standard errors, and percentages have been rounded.

Table 28. Seasonal and annual estimated visits and hours for all access sites on the lower Osage River.*

Activity	Fall		Winter		Spring-Summer		Visits			Total		
	Visits	Hours	Visits	Hours	Visits	Hours	Number	Std. Err.	%	Number	Std. Err.	%
<u>Fishing</u>												
Angling	14824	54510	4846	12054	45178	161506	64448	3200	40	228070	14597	24
Trotline	1613	31828	7	22	5208	115363	6828	694	4	147213	15547	15
Tournament					247	1799	247	128	0	1799	963	0
Gigging	269	989					269	75	0	989	296	0
Snagging	801	3399	29	44	3010	12815	3840	498	2	16258	2079	2
Other Fishing					18	294	18	13	0	294	264	0
Total Fishing	17307	90726	4883	12120	53661	291777	75850	3339	46	394623	22068	41
<u>Hunting</u>												
Deer - Gun	204	769					204	88	0	769	317	0
Deer - Bow	79	342	21	42			100	45	0	384	193	0
Dove	23	46					23	23	0	46	46	0
Rabbit	10	20	69	119			79	34	0	139	67	0
Quail	21	48	42	52			63	44	0	100	61	0
Waterfowl	405	1760					405	71	0	1760	318	0
Predator					5	167	5	5	0	167	167	0
Squirrel	151	433			32	72	183	68	0	505	190	0
Turkey	89	186			109	484	198	131	0	650	480	0
Total Hunting	981	3602	131	214	147	704	1259	208	1	4520	754	0
<u>Trapping</u>												
Camping - Department	684	13822	402	8042	27	13	1113	309	1	21878	7036	2
Camping - Other	458	10203			1891	43158	2349	442	1	53362	10177	6
Picnic - Department	3896	93304			9747	233685	13643	1750	8	326988	41990	34
Picnic - Other	524	925	66	51	1303	5175	1893	253	1	6151	1833	1
	468	1617			1378	5117	1846	422	1	6735	2014	1

* Estimates, standard errors, and percentages have been rounded. Appendices O, P, and Q have seasonal estimates with standard errors.

Table 29. Estimated harvest of fish and wildlife from all locations on the lower Osage River.*

Fishing					
Species	Estimated Harvest	Standard Error	Harvest per Hour	Percent	Average Length
Largemouth Bass	1837	364	.008	1	14.5
Other Black Bass	188	51	.002	0	13.3
White Bass	18084	2241	.069	14	12.1
Bluegill	17528	2108	.047	14	5.4
Buffalo	3518	497	.009	3	16.9
Blue Catfish	3698	971	.009	3	18.3
Channel Catfish	51075	5778	.102	41	15.6
Flathead Catfish	383	107	.002	0	20.2
Carp Suckers	1945	564	.006	2	14.3
Carp	1368	286	.003	1	17.3
Crappie	13032	1736	.035	10	9.3
Drum	7873	1040	.020	6	14.9
Striped Bass	360	118	.003	0	16.5
Paddlefish	2025	357	.012	2	28.2
Other Fish	2014	1457	.005	2	
Total	124922	7138	.277		

Hunting			
Species	Estimated Harvest	Standard Error	Harvest per Hour
Deer	23	23	.027
Dove	139	139	.333
Quail	30	30	.076
Mallard	603	63	.131
Other Ducks	28	21	.017
Turkey	97	97	.032
Rabbit	29	22	.164
Squirrel	550	10	.170

* Estimates, standard errors, and percentages have been rounded.

Table 30. Age and sex composition of users, in percent, of all sites on the lower Osage River.

Season	Age Brackets								Number of Interviews	
	<12	12-15	16-17	18-24	25-34	35-44	45-64	65+	Total	Percent
Male										
Fall	5	2	1	9	29	20	21	13	3007	
Winter	4	2	1	8	38	20	13	14	569	
Spring-Summer	8	5	3	13	31	18	15	8	8922	
Total									12498	
Percent	7	4	2	12	31	18	17	10		72
Female										
Fall	10	4	1	12	23	17	19	14	1035	
Winter	14	4		13	24	14	12	20	169	
Spring-Summer	12	7	4	17	26	15	12	7	3720	
Total									4924	
Percent	11	6	3	16	25	16	14	9		28
Combined										
Fall	6	3	1	10	28	19	20	13	4042	
Winter	6	3	1	9	35	18	13	15	738	
Spring-Summer	9	5	3	14	29	17	14	8	12642	
Total									17422	
Percent	8	5	2	13	29	18	16	9		

Table 31. Number and percent of boat types used at all sites on the lower Osage River.

Boat Type	Number Counted	Percent
Fishing	2952	89
Canoe	31	1
Pontoon	13	0
Pleasure	301	9
Rubber	4	0
Kayak	1	0
Other	7	0
Total	3,309	

COMPARISON WITH OTHER RIVER RECREATIONAL USE SURVEYS

During the late 1970s and early 1980s, recreational use surveys were conducted on three of Missouri's major rivers: the Gasconade (Fleener 1982), the Meramec (Fleener 1988), and the Missouri (Fleener 1989). Recreational use was high on these rivers. Comparison of recreational survey data on the lower Osage River to survey data on the lower areas of the Gasconade, Meramec, and Missouri rivers and the segment of the Missouri River above Jefferson City shows that similar recreational use occurred (Table 32). Fishing hours were similar on all the rivers, as were overall estimated visits and hours.

CONCLUSIONS

The lower Osage River provides recreation opportunities for fishermen, hunters, and non-consumptive users. Fishing is the most important activity on the lower Osage River, based on estimated visits and hours, but the other recreation activities cannot be overlooked for their value in providing a positive outdoor experience for Missouri's natural resources users.

The recreational importance of the lower Osage River is comparable to the lower Gasconade River, the lower Meramec River, and similar segments of the Missouri River.

Table 32. Comparison of selected recreational use on several large rivers.*

River	Miles	Year	Activities	Visits	Std. Err.	%	Hours	Std. Err.	%
Osage-lower	81.7	87-88	Fishing	75650	3339	46	394623	22068	41
(from Bagnell			Camping	15992	1805	9	380350	43206	40
Dam to the			Floating	621	218	0	3108	1118	0
mouth)			Boating	13411	994	8	37420	3665	4
			Hunting	1259	208	1	4520	754	0
			Total	163168	5900		959573	54853	

River	Miles	Year	Activities	Visits	Std. Err.	%	Hours	Std. Err.	%
Gasconade-	89	77-78	Fishing	51060	3970	31	353070	31290	31
lower (from			Camping	18360	1764	11	284490	29444	25
Route E in			Floating	3440	950	2	17040	4110	2
Maries County			Boating	14440	1410	9	55680	7180	5
to the mouth)			Hunting	4150	560	3	13690	1630	1
			Total	162350	6310		1156520	76180	

River	Miles	Year	Activities	Visits	Std. Err.	%	Hours	Std. Err.	%
Meramec-	117	80-81	Fishing	67130	7760	22	333200	92510	28
lower (from			Camping	14530	6870	5	274040	47441	23
M-185 Highway			Floating	36110	7430	12	154580	30050	13
Maries County			Boating	21680	3680	7	65490	13210	5
to the mouth)			Hunting	4020	1210	1	80300	2520	1
			Total	298780	22150		1192190	117080	

* Estimates, standard errors, and percentages have been rounded. Total use estimates and percent of total use represent only recreational use survey data, cooperator data from state parks and campgrounds has been excluded.

Table 32. (Continued).*

River	Miles	Year	Activities	Visits	Std. Err.	%	Hours	Std. Err.	%
Missouri-	144	86-87	Fishing	44160	1570	32	428510	23370	65
lower (from			Camping	2160	275	2	38030	5121	6
Jefferson City			Floating	250	110	<1	2160	1110	<1
to the mouth)			Boating	21300	1520	15	65420	7020	10
			Hunting	3730	9300	3	12390	1770	2
			Total	139970	4270		656340	29690	

River	Miles	Year	Activities	Visits	Std. Err.	%	Hours	Std. Err.	%
Missouri-	116	83-84	Fishing	38390	2030	37	400070	25630	70
(from 2 miles			Camping	3990	1158	4	69670	25380	11
below Miami to			Floating	190	70	<1	2380	1150	<1
Jefferson City)			Boating	7100	730	7	21900	2650	40
			Hunting	7220	1210	7	30320	5140	5
			Total	103520	4250		606760	39140	

* Estimates, standard errors, and percentages have been rounded. Total use estimates and percent of total use represent only recreational use survey data, cooperator data from state parks and campgrounds has been excluded.

ACKNOWLEDGEMENTS

Six clerks were hired for this study. Without their efforts, the data would never have been collected. Will Hansen started the project. He hired the clerks, set their schedules, and collected their data sheets. Before his retirement, he produced the maps and wrote the "Introduction" and "Description of Study Area" sections of this report. George Fleener helped Will initiate the study, providing his experience from past recreational use surveys. Linda Blueitt entered the data so the information could be stored and analyzed on a computer. James Whitley and Barb Bassett provided text editing and Betsy Robertson scanned the maps and reproduced the forms.

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Appendix A. Beginning and ending dates for each season.

Season	Beginning Date	Ending Date
Fall 1987	August 23, 1987	December 19, 1987
Winter 1987-1988	December 20, 1987	March 5, 1988
Spring-Summer 1988	March 6, 1988	August 20, 1988
Fall 1988	August 21, 1988	December 17, 1988

Appendix B. Day of the week and time of day probabilities for the lower Osage River.

Day of the Week	Fall	Winter	Summer
Weekends	.222	.0202	.222
Weekdays	.111	.0101	.111

Time of Day	Fall	Winter	Summer
A: 0000-0800	.03	.01	.05
B: 0800-1600	.60	.90	.55
C: 1600-2400	.37	.09	.40
Total	1.00	1.00	1.00

Appendix C. Site probabilities for the stations sampled on the lower Osage River.

Lower Segment (mouth to King's Bluff, 63 miles)

Station Code	Station Number	Location	Fall	Winter	Summer
L1	1	Bonnot's Mill *			
L2	2	Osage City	.10	.10	.10
L3	3	Mariosa	.20	.20	.20
L4	4	Mariosa Access *			
L5	5	Pike's Camp *			
L6	6	Painted Rock	.35	.35	.20
L7	7	Volmert's	.10	.10	.10
L8	8	St. Thomas *			
L9	9	Osage Tavern *			
L10	10	Capps	.10	.15	.25
L11	11	King's Bluff	.15	.10	.15
Total			1.00	1.00	1.00

* sampled independently with a site probability of 1.00.

Middle Segment (King's Bluff to Federal Highway 54 Bridge, 17 miles)

Station Code	Station Number	Location	Fall	Winter	Summer
M1	12	Tuscumbia *			
M2	13	Camp Bagnell-Lazy "K"	.20	.10	.20
M3	14	Osage River Camp	.60	.70	.60
M4	15	Riverview	.20	.20	.20
Total			1.00	1.00	1.00

* sampled independently with a site probability of 1.00.

Upper Segment (Federal Highway 54 Bridge to Bagnell Dam, 1.7 miles)

Station Code	Station Number	Location	Fall	Winter	Summer
U1	16	Bagnell Access *			
U2	17	Union Electric	.60	.50	.55
U3	18	American Legion	.40	.50	.45
Total			1.00	1.00	1.00

* sampled independently with a site probability of 1.00.

LOWER ORANGE RIVER SURVEY

Clark _____ 7187

7/8/7

[illegible]

Osage River Studies

Time of Day: _____

Day of Week:

Site:

[illegible]

Appendix F. Estimated annual recreational visits and hours for the upper segment during fall.*

Activity	Visits			Hours			
	Number	Std. Err.	Percent	Number	Std. Err.	Percent	Ava. visit Length
<u>Fishing</u>							
Angling	9422	1425	68	36939	9804	65	3.9
Trotline	32	19	0	691	436	1	21.6
Tournament							
Gigging							
Snagging	538	166	4	2320	890	4	4.3
Other Fishing							
Total Fishing	9991	1407	72	39950	9790	70	4.0
<u>Hunting</u>							
Deer - Gun	13	13	0	50	50	0	3.8
Deer - Bow	9	7	0	31	23	0	3.4
Dove							
Rabbit							
Quail							
Waterfowl	42	25	0	224	137	0	5.3
Predator							
Squirrel							
Turkey	8	6	0	35	25	0	4.4
Total Hunting	71	31	1	340	152	1	4.8
Trapping	130	103	1	3123	2479	5	24.0
Camping - Department							
Camping - Other	411	190	3	9857	4548	17	24.0
Picnic - Department	73	33	1	78	35	0	1.0
Picnic - Other	199	68	1	258	88	0	1.3
Swimming							
Floating							
Boating	20	16	0	55	46	0	2.8
Water Skiing							
Nature Study							
Loafing	222	81	2	331	154	1	1.5
Sight Seeing	1995	444	14	1912	516	3	1.0
Cottage							
Off-road Vehicles							
Gathering Products							
Collecting Bait	340	87	2	328	84	1	1.0
Target Shooting	125	125	1	444	444	1	3.6
Hiking	39	23	0	60	37	0	1.5
Dog Training							
Eagle Watching	153	45	1	148	47	0	1.0
Undefined Use	15	15	0	45	45	0	3.0
Grand Total	13784	1443		56927	11484		4.1

* Estimates, standard errors, and percent of grand total have been rounded.

Appendix G. Estimated annual recreational visits and hours for the upper segment during winter.

Activity	Visits			Hours			
	Number	Std. Err.	Percent	Number	Std. Err.	Percent	Ave. visit Length
<u>Fishing</u>							
Angling	4151	1638	55	10964	4858	60	2.6
Trotline							
Tournament							
Gigging							
Snagging	29	21	0	44	31	0	1.5
Other Fishing							
Total Fishing	4180	1636	56	11008	4855	60	2.6
<u>Hunting</u>							
Deer - Gun							
Deer - Bow							
Dove							
Rabbit							
Quail							
Waterfowl							
Predator							
Squirrel							
Turkey							
Total Hunting							
Trapping	147	147	2	3520	3520	19	23.9
Camping - Department							
Camping - Other							
Picnic - Department	66	51	1	51	29	0	0.8
Picnic - Other							
Swimming							
Floating	110	110	1	660	660	4	6.0
Boating	11	11	0	17	17	0	1.5
Water Skiing							
Nature Study							
Loafing	59	40	1	44	32	0	0.7
Sight Seeing	1801	656	24	1403	582	8	0.8
Cottage							
Off-road Vehicles	15	15	0	15	15	0	1.0
Gathering Products							
Collecting Bait	59	34	1	59	34	0	1.0
Target Shooting							
Hiking	7	7	0	4	4	0	0.6
Dog Training							
Eagle Watching	935	334	12	776	242	4	0.8
Undefined Use							
Grand Total	7499	2199		18216	6905		2.4

* Estimates, standard errors, and percent of grand total have been rounded.

Appendix H. Estimated annual recreational visits and hours for the upper segment during summer.*

Activity	Visits			Hours			
	Number	Std. Err.	Percent	Number	Std. Err.	Percent	Ave. visit Length
<u>Fishing</u>							
Angling	25344	1684	61	96578	7611	44	3.8
Trotline	191	121	0	4212	2882	2	22.1
Tournament							
Gigging							
Snagging	2167	283	5	10414	1405	5	4.8
Other Fishing	7	7	0	32	32	0	4.6
Total Fishing	27708	1748	66	111236	9287	51	4.0
<u>Hunting</u>							
Deer - Gun							
Deer - Bow							
Dove							
Rabbit							
Quail							
Waterfowl							
Predator							
Squirrel							
Turkey							
Total Hunting							
<u>Trapping</u>							
Camping - Department	11	11	0	282	282	0	23.8
Camping - Other	3915	1165	9	93948	27956	43	24.0
Picnic - Department	234	71	1	282	86	0	1.2
Picnic - Other	313	111	1	642	249	0	2.1
Swimming	36	36	0	73	73	0	2.0
Floating	107	84	0	849	671	0	7.9
Boating	88	36	0	303	131	0	3.4
Water Skiing							
Nature Study							
Loafing	344	108	1	368	108	0	1.1
Sight Seeing	5980	938	14	7744	1505	4	1.3
Cottage							
Off-road Vehicles							
Gathering Products	57	41	0	57	41	0	1.0
Collecting Bait	2485	579	6	1928	379	1	0.8
Target Shooting	12	12	0	24	24	0	2.0
Hiking	100	67	0	70	43	0	0.7
Dog Training							
Eagle Watching	11	11	0	5	5	0	0.5
Undefined Use							
Grand Total	41769	2578		219499	31230		5.3

* Estimates, standard errors, and percent of grand total have been rounded.

Appendix I. Estimated annual recreational visits and hours for the middle segment during fall.*

Activity	Visits			Hours			
	Number	Std. Err.	Percent	Number	Std. Err.	Percent	Ave. visit Length
<u>Fishing</u>							
Angling	2439	567	23	6841	1361	7	2.8
Trotline	145	60	1	2017	1084	2	13.9
Tournament							
Gigging							
Snagging	263	122	2	1079	534	1	4.1
Other Fishing							
Total Fishing	2847	534	26	9938	1525	10	3.5
<u>Hunting</u>							
Deer - Gun	3	3	0	5	5	0	1.7
Deer - Bow							
Dove							
Rabbit							
Quail							
Waterfowl	304	62	3	1254	264	1	4.1
Predator							
Squirrel	55	36	1	212	146	0	3.9
Turkey							
Total Hunting	362	84	3	1472	333	2	4.1
Trapping	257	190	2	6159	4567	6	24.0
Camping - Department	10	10	0	100	100	0	10.0
Camping - Other	3116	538	29	74686	12916	77	24.0
Picnic - Department							
Picnic - Other							
Swimming							
Floating							
Boating	101	34	1	128	47	0	1.3
Water Skiing							
Nature Study							
Loafing	418	106	4	252	71	0	0.6
Sight Seeing	1527	290	14	1042	214	1	0.7
Cottage							
Off-road Vehicles							
Gathering Products							
Collecting Bait							
Target Shooting							
Hiking							
Dog Training							
Eagle Watching							
Undefined Use	2111	976	20	3318	1523	3	1.6
Grand Total	10773	1547		97112	14819		9.0

* Estimates, standard errors, and percent of grand total have been rounded.

Appendix J. Estimated annual recreational visits and hours for the middle segment during winter.*

Activity	Visits			Hours			
	Number	Std. Err.	Percent	Number	Std. Err.	Percent	Ave. visit Length
<u>Fishing</u>							
Angling	370	297	25	876	594	25	2.4
Trotline	7	7	0	22	22	1	3.1
Tournament							
Gigging							
Snagging							
Other Fishing							
Total Fishing	378	297	26	898	593	26	2.4
<u>Hunting</u>							
Deer - Gun							
Deer - Bow							
Dove							
Rabbit							
Quail							
Waterfowl							
Predator							
Squirrel							
Turkey							
Total Hunting							
Trapping	70	39	5	1672	933	48	23.9
Camping - Department							
Camping - Other							
Picnic - Department							
Picnic - Other							
Swimming							
Floating							
Boating	131	49	9	264	110	8	2.0
Water Skiing							
Nature Study							
Loafing	44	26	3	42	27	1	1.0
Sight Seeing	835	484	57	577	331	17	0.7
Cottage							
Off-road Vehicles							
Gathering Products							
Collecting Bait							
Target Shooting							
Hiking							
Dog Training							
Eagle Watching							
Undefined Use							
Grand Total	1457	758		3454	1327		2.4

* Estimates, standard errors, and percent of grand total have been rounded.

Appendix K. Estimated annual recreational visits and hours for the middle segment during summer.*

Activity	Visits			Hours			
	Number	Std. Err.	Percent	Number	Std. Err.	Percent	Ave. visit Length
<u>Fishing</u>							
Angling	10987	1238	54	36842	5208	21	3.4
Trotline	1076	350	5	22358	7927	13	20.8
Tournament							
Gigging							
Snagging	503	252	2	1708	1011	1	3.4
Other Fishing							
Total Fishing	12565	1370	61	60907	10281	35	4.8
<u>Hunting</u>							
Deer - Gun							
Deer - Bow							
Dove							
Rabbit							
Quail							
Waterfowl							
Predator							
Squirrel							
Turkey							
Total Hunting							
Trapping							
Camping - Department	449	318	2	10774	7640	6	24.0
Camping - Other	3910	926	19	93662	22208	54	24.0
Picnic - Department	16	16	0	16	16	0	1.0
Picnic - Other	83	83	0	334	334	0	4.0
Swimming	91	50	0	102	54	0	1.1
Floating	76	48	0	336	301	0	4.4
Boating	536	256	3	1965	1337	1	3.7
Water Skiing							
Nature Study							
Loafing	1180	219	6	1502	599	1	1.3
Sight Seeing	1252	280	6	2168	1160	1	1.7
Cottage	50	30	0	1189	724	1	23.8
Off-road Vehicles	11	11	0	11	11	0	1.0
Gathering Products	79	35	0	67	34	0	0.8
Collecting Bait							
Target Shooting							
Hiking							
Dog Training							
Eagle Watching							
Undefined Use	210	108	1	286	131	0	1.4
Grand Total	20526	1915		173855	28464		8.5

* Estimates, standard errors, and percent of grand total have been rounded.

Appendix L. Estimated annual recreational visits and hours for the lower segment during fall.*

Activity	Visits			Hours			
	Number	Std. Err.	Percent*	Number	Std. Err.	Percent*	Ave. visit Length
<u>Fishing</u>							
Angling	2763	224	18	10730	876	12	3.9
Trotline	1436	363	9	29120	7301	33	20.3
Tournament							
Gigging	269	75	2	989	296	1	3.7
Snagging							
Other Fishing							
Total Fishing	4469	430	29	40839	7252	46	9.1
<u>Hunting</u>							
Deer - Gun	189	87	1	714	313	1	3.8
Deer - Bow	70	39	0	310	187	0	4.4
Dove	23	23	0	46	46	0	2.0
Rabbit	10	10	0	20	20	0	2.0
Quail	21	13	0	48	31	0	2.3
Waterfowl	59	23	0	282	113	0	4.8
Predator							
Squirrel	95	53	1	220	112	0	2.3
Turkey	82	72	1	151	120	0	1.8
Total Hunting	548	137	4	1791	422	2	3.3
Trapping	296	121	2	4540	2447	5	15.3
Camping - Department	448	105	3	10103	2432	11	22.6
Camping - Other	369	150	2	8761	3593	10	23.7
Picnic - Department	451	133	3	848	292	1	1.9
Picnic - Other	269	208	2	1359	1223	2	5.1
Swimming	575	210	4	941	438	1	1.6
Floating	53	25	0	340	174	0	6.4
Boating	2640	421	17	6251	1392	7	2.4
Water Skiing	510	179	3	1567	620	2	3.1
Nature Study	45	33	0	418	391	0	9.3
Loafing	765	205	5	1001	470	1	1.3
Sight Seeing	2614	262	17	2176	379	2	0.8
Cottage	283	182	2	6502	4345	7	23.0
Off-road Vehicles	13	13	0	13	13	0	1.0
Gathering Products	271	108	2	234	67	0	0.9
Collecting Bait							
Target Shooting	5	5	0	8	8	0	1.6
Hiking	99	52	1	136	95	0	1.4
Dog Training	143	126	1	232	219	0	1.6
Eagle Watching							
Undefined Use	559	110	4	750	247	1	1.3
Grand Total	15457	1114		88839	10468		5.7

* Estimates, standard errors, and percent of grand total have been rounded.

Appendix M. Estimated annual recreational visits and hours for the lower segment during winter.*

Activity	Visits			Hours			
	Number	Std. Err.	Percent	Number	Std. Err.	Percent	Ave. visit Length
<u>Fishing</u>							
Angling	125	40	4	213	76	2	1.7
Trotline							
Tournament							
Gigging							
Snagging							
Other Fishing							
Total Fishing	125	40	4	213	76	2	1.7
<u>Hunting</u>							
Deer - Gun							
Deer - Bow	21	21	1	42	42	0	2.0
Dove							
Rabbit	69	32	2	119	64	1	1.7
Quail	42	42	1	52	52	0	1.2
Waterfowl							
Predator							
Squirrel							
Turkey							
Total Hunting	131	62	4	214	103	2	1.6
Trapping	186	100	6	2850	1803	25	15.3
Camping - Department							
Camping - Other							
Picnic - Department							
Picnic - Other							
Swimming							
Floating							
Boating	264	90	8	392	146	4	1.5
Water Skiing							
Nature Study							
Loafing	70	26	2	59	24	1	0.8
Sight Seeing	1248	444	39	4224	126	38	3.4
Cottage	73	73	2	1760	1760	16	24.1
Off-road Vehicles	22	16	1	11	8	0	0.5
Gathering Products	7	7	0	4	4	0	0.6
Collecting Bait							
Target Shooting							
Hiking							
Dog Training							
Eagle Watching	37	37	1	37	37	0	1.0
Undefined Use	1048	1048	33	5239	5239	47	5.0
Grand Total	3210	1084		11199	5506		3.5

* Estimates, standard errors, and percent of grand total have been rounded.

Appendix N. Estimated annual recreational visits and hours for the lower segment during summer.*

Activity	Visits			Hours			
	Number	Std. Err.	Percent	Number	Std. Err.	Percent	Ave. visit Length
<u>Fishing</u>							
Angling	8847	834	18	28086	2311	10	3.2
Trotline	3941	456	8	88793	10765	31	22.5
Tournament	247	128	1	1799	963	1	7.3
Gigging							
Snagging	341	249	1	692	489	0	2.0
Other Fishing	11	11	0	262	262	0	23.8
Total Fishing	13387	996	27	119633	10969	41	8.9
<u>Hunting</u>							
Deer - Gun							
Deer - Bow							
Dove							
Rabbit							
Quail							
Waterfowl							
Predator	5	5	0	167	167	0	33.4
Squirrel	32	21	0	72	49	0	2.3
Turkey	109	109	0	464	464	0	4.3
Total Hunting	147	111	0	704	496	0	4.8
Trapping	27	27	0	13	13	0	0.5
Camping - Department	1431	287	3	32122	6261	11	22.4
Camping - Other	1926	707	4	46075	16969	16	23.9
Picnic - Department	1052	197	2	4877	1807	2	4.6
Picnic - Other	983	333	2	4142	1542	1	4.2
Swimming	7121	1153	15	16462	2873	6	2.3
Floating	276	159	1	923	493	0	3.3
Boating	9620	855	20	28046	3107	10	2.9
Water Skiing	3099	535	6	13474	2897	5	4.3
Nature Study	7	7	0	15	15	0	2.1
Loafing	897	124	2	1038	182	0	1.2
Sight Seeing	5410	539	11	3295	339	1	0.6
Cottage	506	481	1	12028	11542	4	23.8
Off-road Vehicles	234	98	0	320	196	0	1.4
Gathering Products	330	188	1	686	399	0	2.1
Collecting Bait	137	66	0	142	66	0	1.0
Target Shooting	43	30	0	44	31	0	1.0
Hiking	64	25	0	98	62	0	1.5
Dog Training	41	19	0	70	54	0	1.7
Eagle Watching	44	44	0	44	44	0	1.0
Undefined Use	944	256	2	1630	537	1	1.7
Grand Total	48691	3491	56602	290473	28149		6.0

* Estimates, standard errors, and percent of grand total have been rounded.

Appendix O. Estimated annual recreational visits and hours for all segments combined during fall.*

Activity	Visits			Hours			
	Number	Std. Err.	Percent	Number	Std. Err.	Percent	Ave. visit Length
<u>Fishing</u>							
Angling	14624	1550	37	54510	9936	22	3.7
Trotline	1613	369	4	31828	7395	13	19.7
Tournament							
Gigging	269	75	1	989	296	0	3.7
Snagging	801	208	2	3399	1041	1	4.2
Other Fishing							
Total Fishing	17307	1567	43	90726	12279	37	5.2
<u>Hunting</u>							
Deer - Gun	204	88	1	769	317	0	3.8
Deer - Bow	79	40	0	342	188	0	4.3
Dove	23	23	0	46	46	0	2.0
Rabbit	10	10	0	20	20	0	2.0
Quail	21	13	0	48	31	0	2.3
Waterfowl	405	71	1	1760	318	1	4.3
Predator							
Squirrel	151	64	0	433	183	0	2.9
Turkey	89	72	0	186	123	0	2.1
Total Hunting	981	164	2	3602	559	1	3.7
Trapping	684	248	2	13822	5744	6	20.2
Camping - Department	458	108	1	10203	2435	4	22.3
Camping - Other	3896	590	10	93304	14157	38	23.9
Picnic - Department	524	137	1	925	294	0	1.8
Picnic - Other	468	219	1	1617	1226	1	3.5
Swimming	575	210	1	941	438	0	1.6
Floating	53	25	0	340	174	0	6.4
Boating	2762	422	7	6434	1394	3	2.3
Water Skiing	510	179	1	1567	620	1	3.1
Nature Study	45	33	0	418	391	0	9.3
Loafing	1405	244	4	1585	500	1	1.1
Sight Seeing	6136	592	15	5130	657	2	0.8
Cottage	283	182	1	6502	4345	3	23.0
Off-road Vehicles	13	13	0	13	13	0	1.0
Gathering Products	271	108	1	234	67	0	0.9
Collecting Bait	340	87	1	328	84	0	1.0
Target Shooting	130	125	0	452	444	0	3.5
Hiking	138	57	0	196	102	0	1.4
Dog Training	143	126	0	232	219	0	1.6
Eagle Watching	153	45	0	148	47	0	1.0
Undefined Use	2685	982	7	4113	1543	2	1.5
Grand Total	40014	2391		242878	21473		6.1

* Estimates, standard errors, and percent of grand total have been rounded.

Appendix P. Estimated annual recreational visits and hours for all segments during winter.*

Activity	Visits			Hours			
	Number	Std. Err.	Percent	Number	Std. Err.	Percent	Ave. visit Length
<u>Fishing</u>							
Angling	4646	1665	38	12054	4895	37	2.6
Trotline	7	7	0	22	22	0	3.1
Tournament							
Gigging							
Snagging	29	21	0	44	31	0	1.5
Other Fishing							
Total Fishing	4683	1663	38	12120	4892	37	2.6
<u>Hunting</u>							
Deer - Gun							
Deer - Bow	21	21	0	42	42	0	2.0
Dove							
Rabbit	69	32	1	119	64	0	1.7
Quail	42	42	0	52	52	0	1.2
Waterfowl							
Predator							
Squirrel							
Turkey							
Total Hunting	131	62	1	214	103	1	1.6
Trapping	402	182	3	8042	4064	24	20.0
Camping - Department							
Camping - Other							
Picnic - Department	66	38	1	51	29	0	0.8
Picnic - Other							
Swimming							
Floating	110	110	1	660	660	2	6.0
Boating	406	103	3	672	184	2	1.7
Water Sking							
Nature Study							
Loafing	172	54	1	145	48	0	0.8
Sight Seeing	3883	929	32	2401	681	7	0.6
Cottage	73	73	1	1760	1760	5	24.1
Off-road Vehicles	37	22	0	26	17	0	0.7
Gathering Products	7	7	0	4	4	0	0.6
Collecting Bait	59	34	0	59	34	0	1.0
Target Shooting							
Hiking	7	7	0	4	4	0	0.6
Dog Training							
Eagle Watching	972	336	8	812	245	2	0.8
Undefined Use	1048	1048	9	5239	5239	16	5.0
Grand Total	12167	2566		32869	8931		2.7

* Estimates, standard errors, and percent of grand total have been rounded.

Appendix Q. Estimated annual recreational visits and hours for all segments during summer.*

Activity	Visits			Hours			
	Number	Std. Err.	Percent	Number	Std. Err.	Percent	Ave. visit Length
<u>Fishing</u>							
Angling	45178	2250	41	161506	9508	24	3.6
Trotline	5208	587	5	115363	13676	17	22.2
Tournament	247	128	0	1799	963	0	7.3
Gigging							
Snagging	3010	453	3	12815	1799	2	4.3
Other Fishing	18	13	0	294	264	0	16.3
Total Fishing	53661	2434	48	291777	17671	43	5.4
<u>Hunting</u>							
Deer - Gun							
Deer - Bow							
Dove							
Rabbit							
Quail							
Waterfowl							
Predator	5	5	0	167	167	0	33.4
Squirrel	32	21	0	72	49	0	2.3
Turkey	109	109	0	464	464	0	4.3
Total Hunting	147	111	0	704	496	0	4.8
Trapping	27	27	0	13	13	0	0.5
Camping - Department	1891	429	2	43158	9881	6	22.8
Camping - Other	9747	1647	9	233685	39531	34	24.0
Picnic - Department	1303	210	1	5175	1809	1	4.0
Picnic - Other	1378	361	1	5117	1598	1	3.7
Swimming	7248	1154	7	16636	2874	2	2.3
Floating	459	186	0	2108	886	0	4.6
Boating	10244	894	9	30314	3385	4	3.0
Water Skiing	3099	535	3	13474	2897	2	4.3
Nature Study	7	7	0	15	15	0	2.1
Loafing	2421	274	2	2909	636	0	1.2
Sight Seeing	12641	1117	11	13208	1930	2	1.0
Cottage	556	482	1	13217	11564	2	23.8
Off-road Vehicles	244	99	0	331	196	0	1.4
Gathering Products	467	196	0	810	402	0	1.7
Collecting Bait	2622	583	2	2070	385	0	0.8
Target Shooting	55	32	0	68	40	0	1.2
Hiking	164	72	0	168	76	0	1.0
Dog Training	41	19	0	70	54	0	1.7
Eagle Watching	55	46	0	50	45	0	0.9
Undefined Use	1154	278	1	1916	553	0	1.7
Grand Total	110987	4744		683826	49679		6.2

* Estimates, standard errors, and percent of grand total have been rounded.